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CANCER OF THE LARYNX

IMMEDIATE AND ULTIMATE RESULTS OF OPERATION IN ONE HUNDRED AND TWO CASES

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It is well at times to make an analytic survey of one's work in a special field and to evaluate one's findings. In the contents of this paper, comprising the results of operation in 102 cases of cancer of the larynx, the findings are tabulated under two headings, laryngectomy and laryngofissure.

ETIOLOGY

In analyzing this series of cases I can find no enlightenment as to the origin of cancer.

TABLE 1.—*Sex and Age at Time of Operation*

	Age					
	25 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 or Over
Laryngectomy						
Male	2	5	22	23	25	9
Female	0	4	2	2	0	0
Laryngofissure						
Male	2	0	0	1	1	1
Female	0	0	2	1	0	0

A history of hereditary involvement was found to exist in only 13 instances. Chronic irritation of some sort or other was noticed in 24 cases, or approximately 25 per cent.

Ninety-one patients were men and 11 women, which gives a ratio of approximately 10 men to every woman.

Cancer is supposed to be rare in persons under 40 years of age, yet in this series there were 11 patients under 40, the youngest being 25 and the oldest 76 at the time of operation.

Among men, involvement occurred in the largest number of cases in the sixth or seventh decade of life. Two patients were Negroes, 1 aged 29 years at the time of operation and the other aged 28. The

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latter patient had myxosarcoma of the larynx (figs. 3 and 4). Among women, involvement in the largest number occurred in the third or the fourth decade of life.

Among possible causes, excessive use of the voice was found to have played a part in 30 patients.

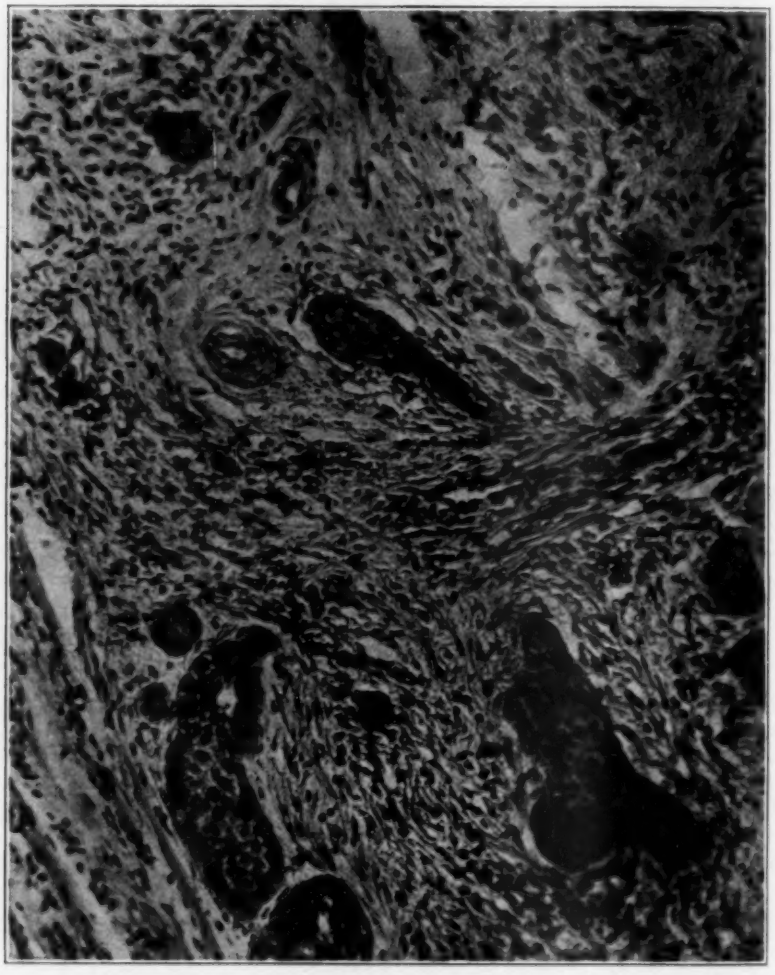

Fig. 1.—Basal cell carcinoma, an invading malignant growth of all the layers of the surface epithelium; low power.

Considering the part that alcohol and tobacco played in causing cancer, I found only 18 patients who had used alcohol moderately or a little more, whereas 38 had used tobacco to excess. No great increase of cancer has followed promiscuous smoking of cigarets by either men or women.

Syphilis as an etiologic factor in preparing the soil for the growth of cancer was observed in only 3 cases, 1 of which was that of a Negro who had myxosarcoma of the larynx (figs. 3 and 4).

Papilloma of the larynx was found in 3 cases, in all of which there had been prolonged observation and frequent removal of papillomas.

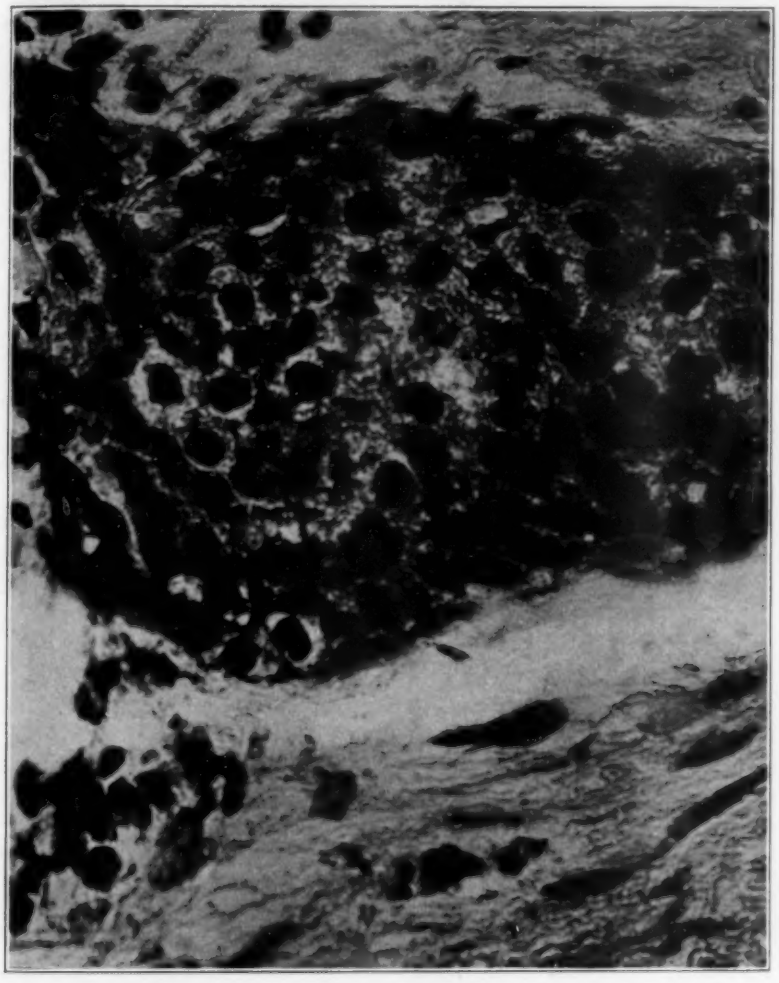

Fig. 2.—Same section shown in figure 1; high power.

In each instance the papilloma was found to have become malignant in the sixth decade of life. One patient was observed in 1928 to have papilloma of the larynx and was under observation for nine years before the growth took on a malignant character. This patient underwent total laryngectomy at the age of 71 years and is alive and well at

the present time. Another patient, aged 69 years, had been observed for fifteen years by competent laryngologists, who had removed papillomas; he was referred to me last year for operation. The third patient was seen by a competent laryngologist in 1921, because of chronic

Fig. 3.—Myxosarcoma of the larynx; low power. The tumor is vascular. It shows mucoid areas of connective tissue and areas of large spindle cells, many with mitotic figures.

hoarseness and multiple papillomas of two years' duration. In this case the papillomas did not become malignant until 1932. It is interesting to note that all these patients used their voices to excess.

Pachyderma laryngis, which Jackson [1] and others have stated is a precancerous condition, was found in 2 cases. In 1 instance it was only after repeated biopsy that malignant growth was diagnosed. The patient had a sinus from the larynx to the surface of the skin at the thyroid cartilage, and it was necessary to remove a large area of skin,

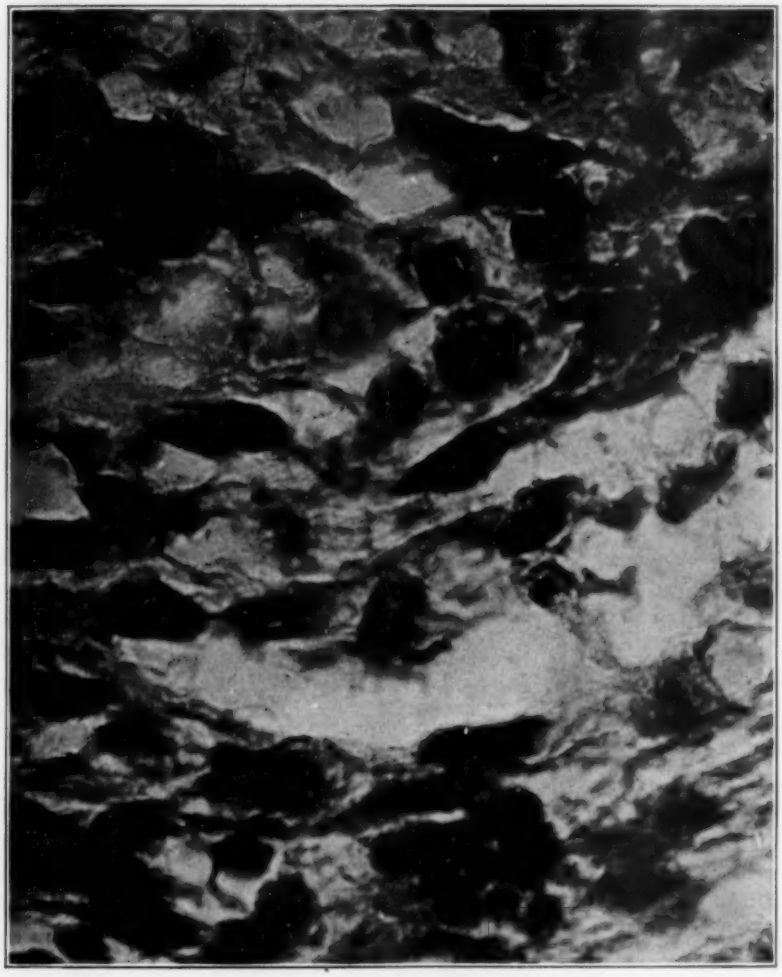

Fig. 4.—Same section shown in figure 3; high power.

fascia and muscle surrounding this sinus in performing the laryngectomy. The growth was of squamous cell type. The patient underwent total laryngectomy in 1927 and is alive and well at present, with a good pharyngeal voice (figs. 13 and 14).

1. Jackson, C.: The Larynx and Its Diseases, Philadelphia, W. B. Saunders Company, 1937, pp. 376-496.

Fig. 5.—Epidermoid carcinoma of the larynx (grade 1), showing irregular papillae covered by thickened stratified squamous epithelium, some dipping into the submucous tissue in the form of nests with central cornification; low power.

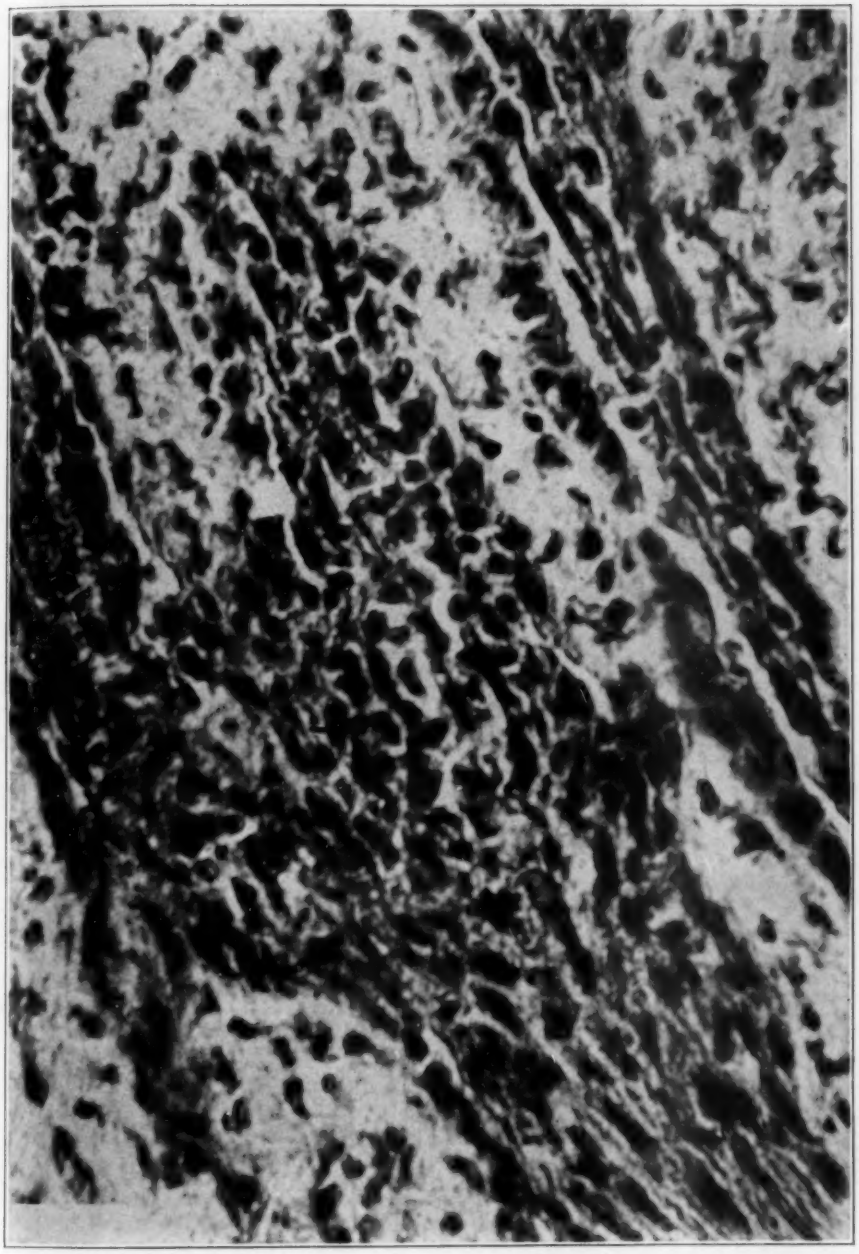

Fig. 6.—Same section shown in figure 5; high power.

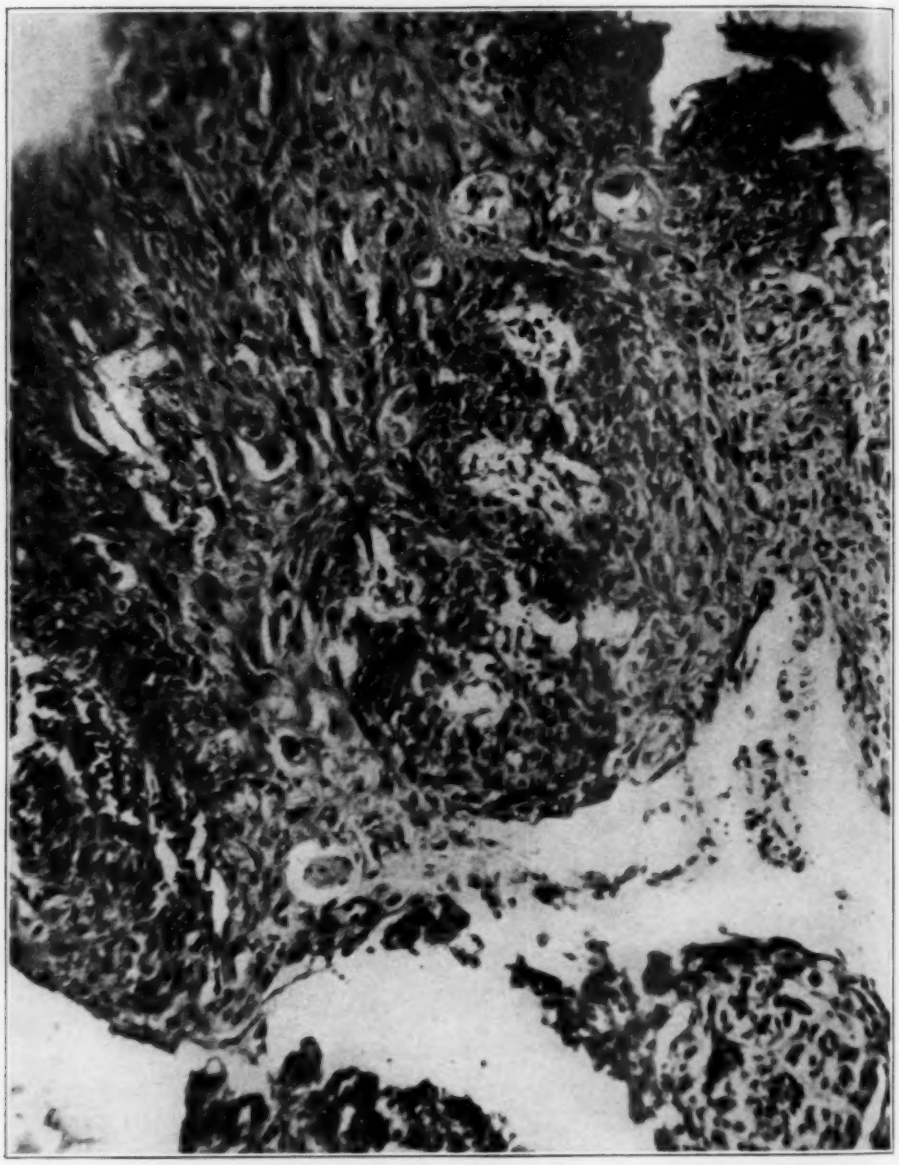

Fig. 7.—Epithelioma of the larynx (grade 2); low power. The stroma is invaded by groups and strands of carcinomatous cells showing considerable hyperchromatism and a moderate number of mitotic forms. There is a moderate fibrous reaction in the stroma.

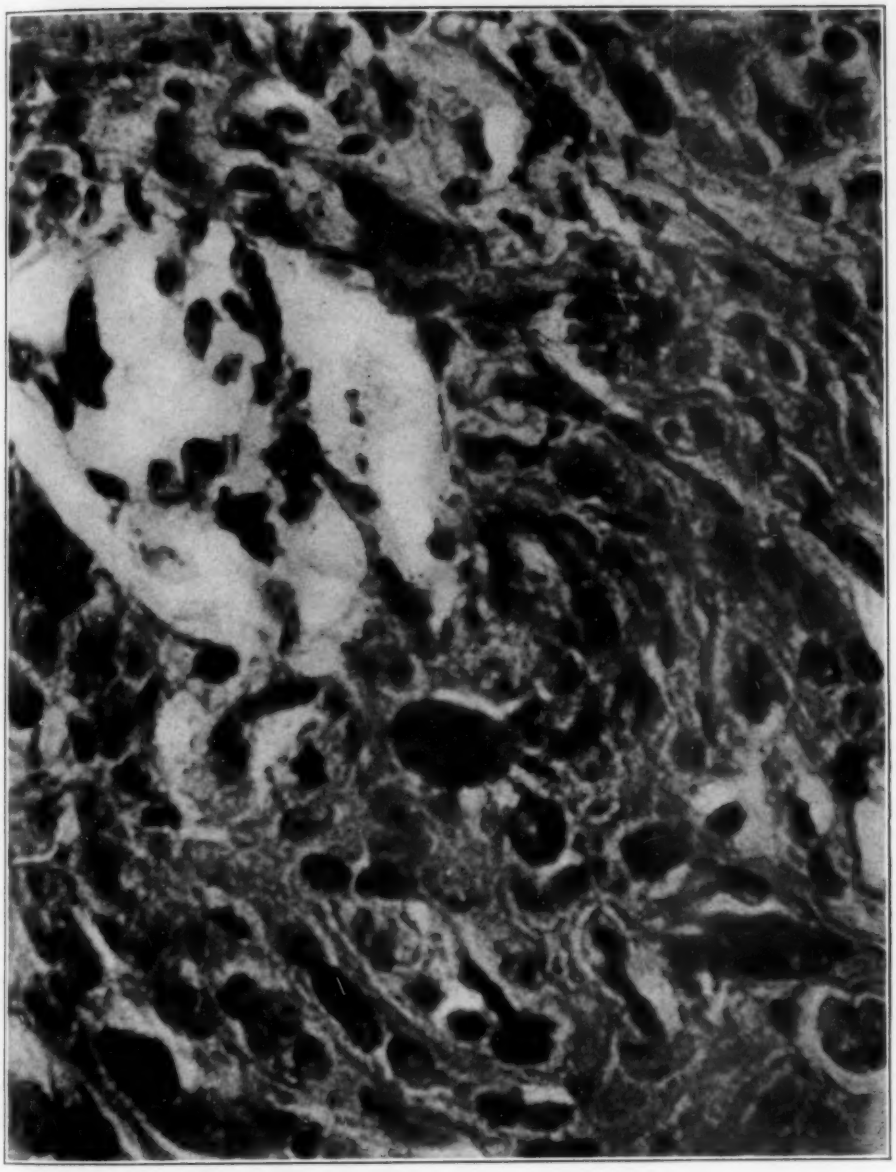

Fig. 8.—Same section shown in figure 7; high power.

The possibility that irritating gases play a part in producing cancer was suggested by the case of a man who had been severely gassed during the World War with mustard gas. Whether the development of cancer was a coincidence or was caused by the gas is difficult to determine, as

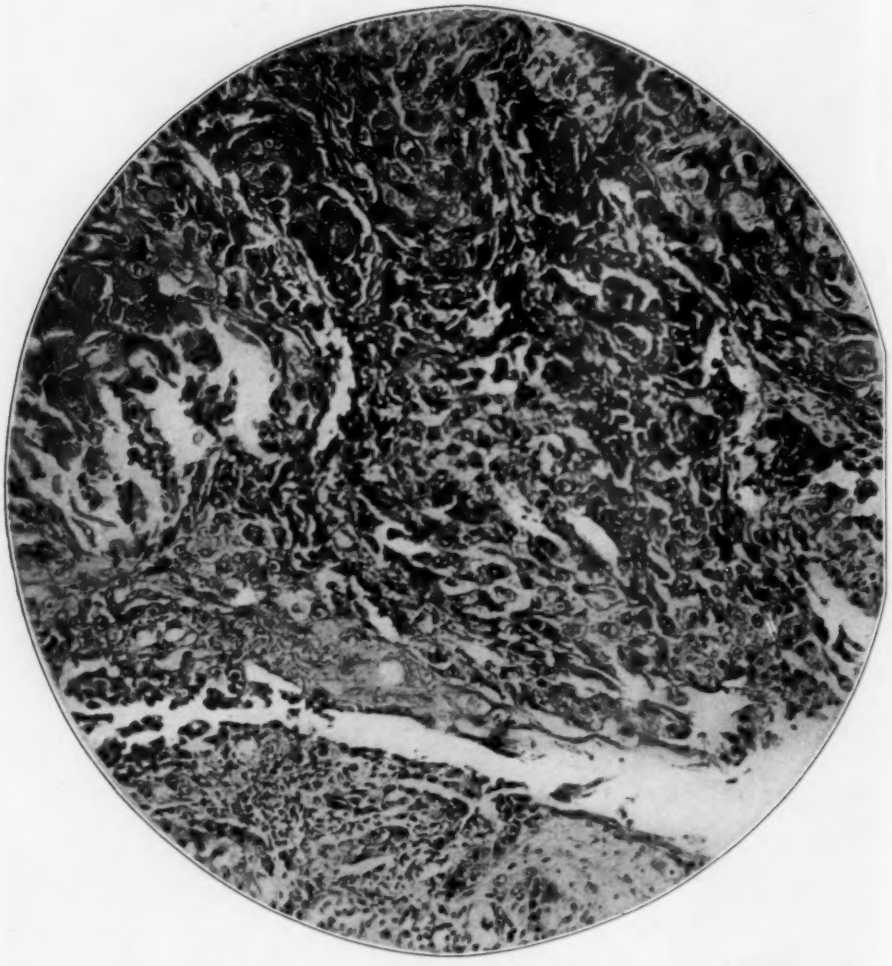

Fig. 9.—Epidermoid carcinoma of the larynx (grade 3); low power. There is an invasive growth of groups of atypical pavement epithelial cells beneath the surface epithelium. The individual cells are larger than normal and show marked variation in staining. There are numerous epithelial pearls and a few mitotic figures.

I have observed only 1 such instance. This patient underwent laryngectomy in 1925; he is still living and has one of the best pharyngeal voices imaginable (figs. 1 and 2).

CLASSIFICATION

In this series the involvement was intrinsic in 62 cases and was situated below the glottis in 15, in the piriform sinus in 12, in the epiglottis in 2, in the aryepiglottic fold in 7, in the arytenoid cartilage in 2

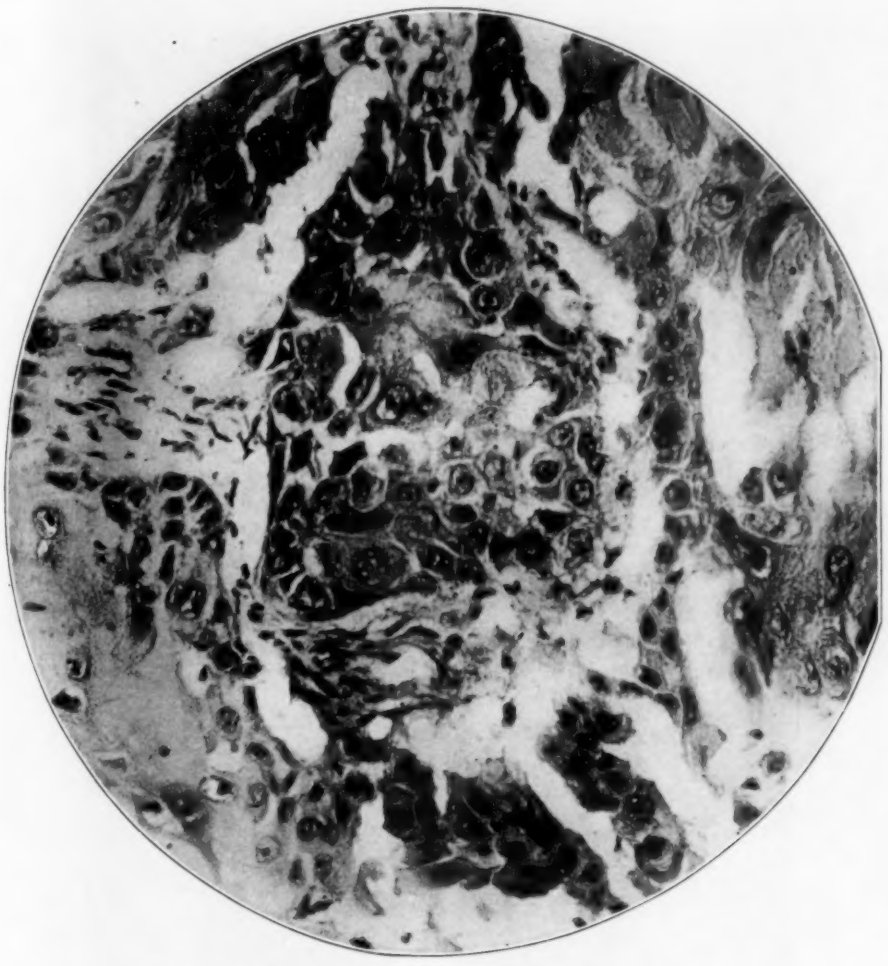

Fig. 10.—Same section shown in figure 9; high power.

and behind the cricoid cartilage in 2. The involvement in the last five locations is known as extrinsic or epilaryngeal and hypopharyngeal.

Intrinsic Cancer.—The involvement in 75 per cent of cases (77) was intrinsic, originating in the interior of the larynx.

Intrinsic cancer in the interarytenoid area is rarely seen. Laryngeal cancer involving the ventricular band and the ventricles is rare and is

more dangerous than true chordal cancer. A growth situated in this area causes early glandular involvement. The vocal cord is the favorite site of typical intrinsic laryngeal cancer, which usually spreads along the cord and may became subglottic and spread to the opposite cord or cross at the anterior commissure.

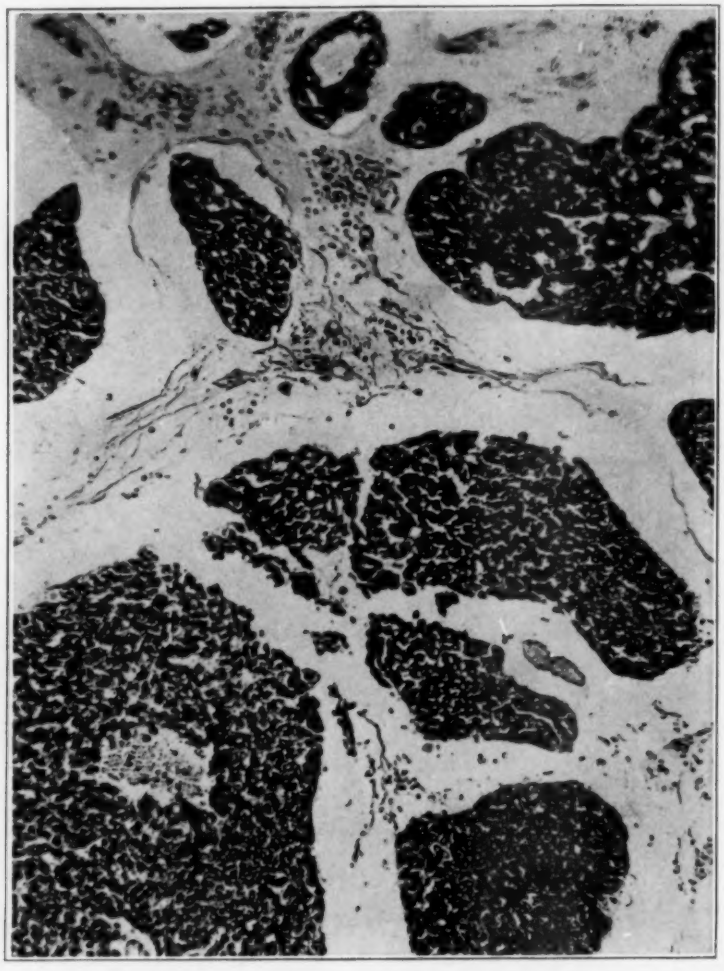

Fig. 11.—Undifferentiated carcinoma of the larynx (grade 4); low power. The surface epithelium is hypertrophic. In the fibrous stroma there are an extensive invasive growth of groups, cords and masses of undifferentiated epithelial cells which vary considerably in size and some mitosis.

In intrinsic, or chordal, cancer lymphatic drainage is almost negligible, and the results of laryngofissure include from 75 to 85 per cent cures, with practically no operative mortality. In this series, of 8

patients who underwent laryngofissure, 6 patients are alive and well at present, the period since operation ranging from ten to eighteen years.

The symptoms of intrinsic cancer depend on the site of growth. A growth affecting the tension, vibration and approximation of the cords will produce hoarseness.

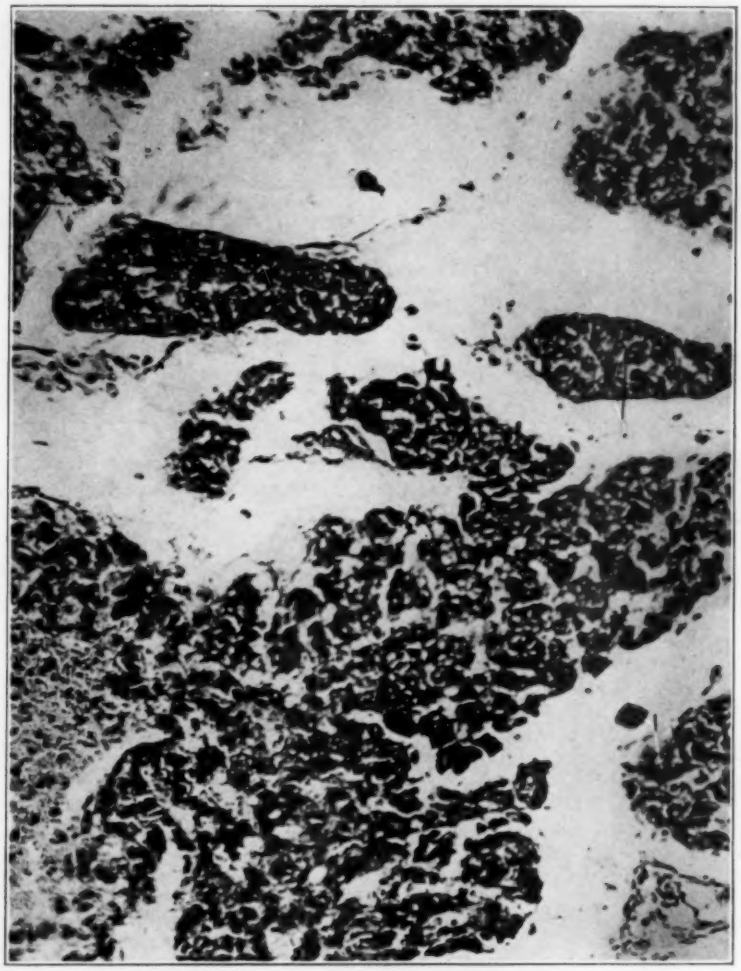

Fig. 12.—Same section shown in figure 11; high power.

Intrinsic true chordal cancer is located on the surface or the edge of the vocal cord. It may, and often does, extend into the ventricle of the larynx and below the cord into the subglottic area.

Summary: Intrinsic cancer is usually benign in the early stages. It grows slowly and if limited to the vocal cord does not metastasize to the

glands. The malignant growth is usually squamous cell epithelioma, but occasionally of basal cell type. Adenocarcinoma is usually seen in the ventricles. Other forms are rare. This type must be differentiated from singer's nodule, leukoplakia, innocent tumor, tuberculosis and

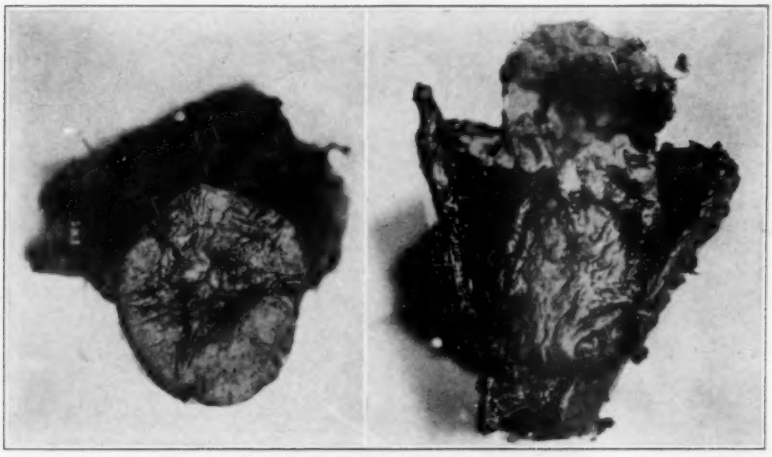

Fig. 13.—Epithelioma of the larynx. The patient had pachyderma and a sinus extending to the surface of the skin. Laryngectomy was performed in 1927. The patient is still living.

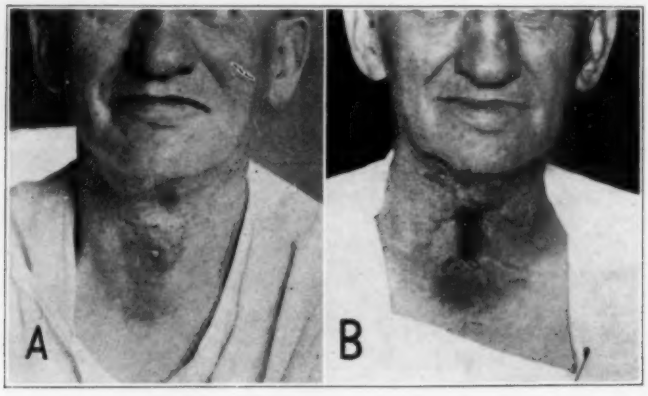

Fig. 14.—Patient (*a*) before operation; (*b*) after operation, in 1927.

syphilis. The course usually extends over several years, depending on the location and the grade of the tumor. Even the most malignant forms usually last over two years.

The outlook in this type of cancer is most favorable for cure if diagnosis is made early.

Subglottic Cancer.—Subglottic cancer originates on the inner or the under surface of the vocal cords or the subglottic area, chiefly in the anterior half of this region.

The subglottic type, of which there were 15 cases in this series, although well within the larynx, has a large amount of lymphatic drainage, with possible early metastasis along the party wall—into the esophagus or the trachea, for instance. For this type I prefer total

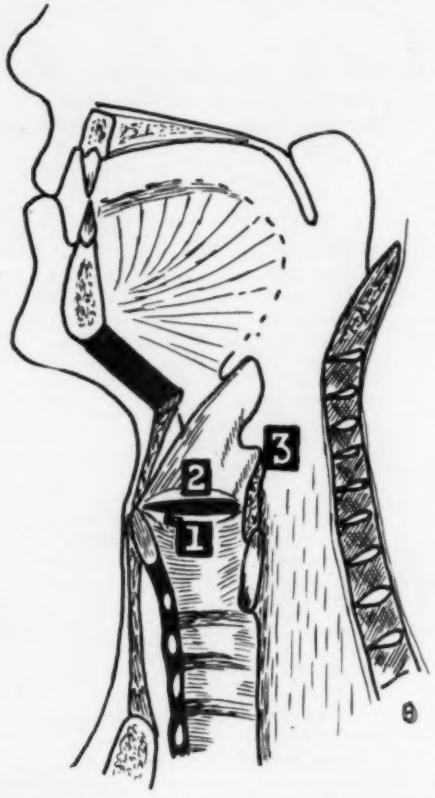

Fig. 15.—Intrinsic cancer (about 75 per cent of laryngeal cancer is intrinsic). *1* shows the vocal cord, a favorite site for intrinsic cancer, which spreads along the cord and may become subglottic and spread to the opposite cord or across the commissure. *2* shows the ventricular band and ventricle. These are rarely involved, but their involvement is more dangerous than that of the cord, causing early glandular involvement. *3* shows the interarytenoid area, which is rarely affected.

The disease is benign in its early stages and grows slowly. If limited to the vocal cords it does not metastasize to the ganlds. Cancer is usually squamous cell and occasionally basal cell epithelioma. Other forms are rare. Adenocarcinoma is seen in the ventricles. The condition must be differentiated from singer's nodule, leukoplakia, innocent tumors, tuberculosis and syphilis. Its course usually extends over several years, depending on the location and the grade of tumor. Even the most malignant forms usually last over two years.

laryngectomy to laryngofissure, for in my series (table 2) there were 7 in which the site of the growth at operation was subglottic, and in all these there was a recurrence in the glands of the neck or metastasis to the brain and the lung, and possibly in 1 case to the prostate. It would seem inevitable that if these growths recurred after total laryngectomy they certainly would have done so after laryngofissure. Therefore, I reiterate that I prefer total laryngectomy to laryngofissure for this type of cancer.

TABLE 2.—*Deaths from Malignant Growth Elsewhere Than Larynx in Cases in Which Laryngectomy Was Done*

Case No.	Age at Operation, Yr.	Time of Onset after Operation, Yr.	Time of Onset after Operation, Mo.	Site of Growth at Operation	Age at Death, Yr.	Site of Recurrence
1	50		6	Subglottic	50	Glands
2	63		13	Piriform sinus	64	Glands
8	66		8	Piriform sinus	66	Glands
9	50	1		Epiglottis	51	Tongue
10	60	1	6	Arytenoid cartilage; aryepiglottic fold	62	Glands
13	60	2		Ventricle	62	Esophagus
14	55	2		Postcricoid	57	Esophagus
16	74		9	Piriform sinus	75	Esophagus
20	37	2	6	Trachea (subglottic)	40	Brain and lung
29	63	1		Piriform sinus	64	Neck
37	60		5	Aryepiglottic fold	60	Glands
38	67		8	Piriform sinus	68	Glands
40	69	2	6	Cord; ventricle	72	Glands
42	73	1		Epiglottis; ventricle; piriform sinus	74	Glands
43	48	1		Piriform sinus	49	Glands
51	44	1	5	Piriform sinus	45	Glands
52	45	2		Esophagus	47	Glands
53	65	2	6	Subglottic	68	Tongue and glands
54	73	1	4	Subglottic	74	Lung
56	69	1		Subglottic	70	Brain and lung
70	53		9	Aryepiglottic fold; piriform sinus	54	Tongue
78	40	1	3	Subglottic	41	Glands
87	49		6	Left cord extending to subglottic area	49	Prostate?

The subglottic type originates below the cords, usually in the anterior third, and may involve the anterior commissure, spread to the opposite side and continue to spread upward to the vocal cords or downward to the cricoid cartilage.

Hoarseness is late in cases of this type, although sluggish movement of the cord was noticed. The lesion is usually demonstrable by direct and indirect examination of the larynx.

Dyspnea may be the first symptom; in 1 case it was the only symptom, and for this the patient was referred to me. On laryngeal examination I could plainly see a large growth protruding into the larynx, almost reaching the opposite side.

Dyspnea remains the only symptom until the growth has progressed to affect the mechanism of the larynx and produce hoarseness or to cause stenosis and thereby necessitate tracheotomy.

Summary: Subglottic cancer may spread over a large area before being recognized. Anteriorly it commonly passes through the cricothy-

Fig. 16.—Subglottic cancer originates on the inner or the under surface of the vocal cords or the subglottic area (chiefly in the anterior half of this region). *1* shows intrinsic cancer of the cord becoming subglottic at the anterior commissure; *2* intrinsic cancer of the cord on the inner or the under surface but below the free edge (invasion of the opposite cord is by the subglottic route or across the commissure); *3*, true subglottic cancer.

The disease may spread over a large area before being recognized. Anteriorly it commonly passes through the cricothyroid membrane and metastasizes to the lymph nodes; often it extends behind the isthmus of the thyroid gland and may extend into the trachea. Posteriorly it may extend to the arytenoid cartilages, invading the pharyngeal mucosa; rapid metastasis to the lymph nodes occurs along the course of the internal jugular vein. Superiorly it may extend into the supraglottic region, invading the base of the epiglottis. Usually the lymph glands escape if the growth is confined to the interior of the larynx or the epiglottis. This is due to poor lymphatic drainage and resistance of cartilaginous walls. The growth is practically always squamous cell epithelioma.

roid membrane and metastasizes to the lymph nodes over this area. It often extends behind the isthmus of the thyroid gland and may extend down into the trachea. Posteriorly it may extend to the arytenoid cartilage involving the pharyngeal mucosa, where rapid metastasis to the lymph nodes along the course of the internal jugular vein takes place. Superiorly it may extend into the supraglottic region, invading the base of the epiglottis.

Usually the lymph glands escape as long as the growth is confined to the interior of the larynx or even to the epiglottis. This is due to poor lymphatic drainage and resistance of the cartilaginous walls.

Subglottic cancer is practically always of squamous cell type.

Extrinsic cancer.—Extrinsic cancer originates around the glottic opening or on its outer surfaces. This class may be subdivided into the epilaryngeal type, which includes neoplasms arising from the epiglottis, the aryepiglottic folds, the arytenoid cartilages and the pyrifrom sinus (23 cases in this series), and the hypopharyngeal type, which includes postcricoid cancer (2 neoplasms in this series). Extrinsic cancer is more malignant, and with earlier metastasis to the cervical glands, than intrinsic cancer.

Some pathologists have stated that this type is seldom arrested or cured by surgical procedures. In my series there were 40 cases of extrinsic cancer, with the subglottic type included; there were 23 deaths, or approximately 42 per cent recoveries.

I believe that in the treatment of the epilaryngeal and the hypopharyngeal type of cancer, if early diagnosis is made, good results can be obtained. Too often when the patient presents himself for examination he is beyond any hope of a five year cure. All types of involvement should be diagnosed early, for they are readily seen by direct or indirect examination.

The symptoms depend on the site of the lesion, but hoarseness, a tickling sensation, constant clearing of the throat and a persistent abnormal sensation in this region should arouse the physician to the fact that he is dealing with a potential malignant growth. Later, localized or referred pain, loss of appetite, difficulty in swallowing, increased salivation and enlarged cervical glands usually denote a late, and too often an inoperable, state.

Summary: Extrinsic cancer is usually of squamous cell type, although it may be papillary or occasionally of basal cell type.

An epithelioma originating on the epiglottis is of relatively low grade malignancy until the growth has spread either to the base of the tongue or to the aryepiglottic fold. In other epilaryngeal situations, however, the lymphatic glands are invaded early and consistently.

Extrinsic malignant growth, therefore, is a serious problem, and as Jackson stated, "To look and see is better than to wait and see."

The glands are affected early; the course is fairly rapid, and unless prompt treatment is instituted a year or a year and a half is the average span of life for the patient.

It is true that cancer cannot be cured in all cases, but certainly if this region is examined with painstaking thoroughness much can be accomplished by early diagnosis and radical operation, for cosmetic considerations have no place in the treatment of malignant growths.

Fig. 17.—Extrinsic cancer. In this group are included neoplasms growing from the epiglottis, the aryepiglottic folds, the arytenoid cartilages, the piriform sinuses and the pharyngeal surface of the cricoid cartilage (postcricoid cancer). *1* shows the margins of the epiglottis; *2*, the aryepiglottic folds; *3* the arytenoid cartilages; *4*, the piriform sinuses; *5*, the pharyngeal surface of the cricoid cartilage.

Extrinsic cancer is usually of squamous type, but may be papillary. Occasionally the basal cell type occurs. Cancer of the epiglottis is of relatively low grade malignancy, unless the growth has spread to the base of tongue or the aryepiglottic fold. In other situations lymphatic glands are invaded early. "To look and see is better than to wait and see."

PATHOLOGY

Histology.—Included in my series were 1 melanosarcoma, 1 myxosarcoma and 4 basal cell and 22 papillary epitheliomas, the most frequent type being the squamous cell carcinoma. The sarcomas originated in the right arytenoid cartilage.

A comparison of Mackenty's [2] table with the findings in my series on the relative frequency of types of cancer of the larynx follows:

Mackenty's Series (Percentage)		This Series (Percentage)
96	Squamous cell carcinoma	75
2	Basal cell carcinoma	3
1	Papillary carcinoma	20
1	Adenocarcinoma	2

Metastatic tumors of the larynx are exceedingly rare, although inoculation metastasis in the respiratory tract has been reported by Hitz and Oesterlin.[3] With this in mind, the surgeon should be careful about disturbing a growth at the time of operation.

Turner [4] described a case in which the first sign of renal cancer was due to a metastasis in one vocal cord. In 1 of my cases operation was performed in 1937 for an intrinsic growth of a papillary type, grade 1, involving the left vocal cord and dipping into the subglottic area. Within nine months the patient died of a large inoperable cancer of the prostate. It is probable that in this case the original tumor might have been in the prostate and metastasized to the larynx.

In my series metastatic glands in the neck and to the tongue were observed. These have usually involved the piriform sinus and the aryepiglottic folds. Metastasis in the esophagus through the party wall occurred in 1 patient. In another patient there was metastasis to the brain and the lung from an adenocarcinoma of the subglottic region two and one-half years after operation. Three patients had metastasis to the lung, 3 to the esophagus, 5 to the tongue and 15 to the glands of the neck. The patients who had metastasis to the lung had metastasis to the brain as well.

In the basal cell type there is apt to be little tendency to recurrence. There were 4 cases of basal cell carcinoma in my series. One case was that of a man 72 years of age at the time of operation; he died

2. Mackenty, J. E.: Some Observations on the Cases of Laryngeal Cancer Seen During the Past Year with Microscopical Findings in Three Incipient Cases, Tr. Am. Laryng. A. **45**:45, 1923.

3. Hitz, H. B., and Oesterlin, E.: A Case of Multiple Papillomata of the Larynx with Aerial Metastases to the Lungs, Am. J. Path. **8**:333 (May) 1932.

4. Turner, A. L.: Metastatic Malignant Tumor of the Larynx, Secondary to Adeno-Carcinoma of the Right Kidney, J. Laryng. & Otol. **39**:181 (April) 1924.

of apoplexy twelve years and eleven months after operation. Another patient was operated on at the age of 50 years, and he is still living twelve years and eight months after operation.

In 1 case of adenocarcinoma the lesion was located in the subglottic region.

According to the classification of Broder, the growth in 73 cases was reported by the pathologists as of grade 1 in 27, of grade 2 in 26, of grade 3 in 16 and of grade 4 in 4.

Of the 4 patients with growths of grade 4, 1, who had adenocarcinoma, died two and one-half years after operation of metastasis in the brain and the lung; another, who had intrinsic squamous cell carcinoma, died of apoplexy two and one-half years after operation, without any recurrence; a third, who had squamous cell epithelioma of the right piriform sinus, is still living, according to my records, and a fourth, who had squamous cell epithelioma, died of pneumonia six day after operation.

In other words, among my patients with growths of grade 4, which are supposedly not amenable to surgical procedure, 1 patient who had cancer of the piriform sinus is living six years after operation.

SYMPTOMS

The symptoms, of course, vary according to the location of the lesion, whether it is intrinsic, epilaryngeal or hypopharyngeal.

In 89 cases there had been hoarseness of from six weeks to fifteen years' duration. Hoarseness is caused by some interference in the vibration, the approximation or the tension of the vocal cord. This should arouse suspicion of any hoarseness extending over a few weeks in an adult and careful examination of the larynx should be made to ascertain the cause.

Local discomfort that might be characterized as a constant desire to clear the throat and a tickling sensation strong enough to produce cough was noted in 59 cases, more frequently with the epilaryngeal or the hypopharyngeal type of growth, probably because involvement of the superior laryngeal nerve permitted saliva or food to trickle into the larynx and produce coughing.

Pain was next in frequency among symptoms, 45 patients complaining of pain that was referred to the larynx, to the side of the neck or to either ear.

Dyspnea on moderate exertion was complained of by 29 patients.

Seventeen patients gave symptoms of stridor and wheeze.

Difficulty in swallowing, or dysphagia, was complained of by 25 patients.

Fetor, due to ulceration, was noted by 9 patients.

Increased salivation was complained of by 15 patients. These were mostly of persons who had the epilaryngeal or the hypopharyngeal type of lesion.

Blood-streaked sputum or saliva was noticed by 5 patients.

An interesting observation was that 39 patients had lost weight. Usually loss of weight is considered a late sign, but in this series about one third of the patients stated at the first examination that they had lost weight.

PHYSICAL SIGNS

Alteration of voice was observed in one way or another in 89 patients operated on. It would seem, therefore, that any alteration of voice extending over a considerable time should be regarded seriously and every effort made to determine the cause.

Fig. 18.—Epithelioma of the larynx, crossing from the left vocal cord below the anterior commissure and invading the opposite cord. Laryngectomy was performed.

The movements of the vocal cords were noted, and the following tabulation made of the results:

	Cord Sluggish		Cord Fixed	
Cords Free	Right	Left	Right	Left
30	25	14	19	14

This shows that the vocal cords do not have to be sluggish in their movement or even fixed for a larynx to harbor cancer. So, if the physician waits for a cord to become sluggish, he has lost valuable time for early diagnosis.

Why the right cord should have been affected more often than the left in this series I am not prepared to state.

Local discomfort in the larynx or the throat for some time was mentioned in 59 cases.

In 27 cases there was dyspnea which ranged from a slight manifestation with the slightest exertion to almost urgent symptoms necessitating preoperative tracheotomy in 10 cases. The severe form naturally occurred in association with subglottic growths. Stridor accompanied

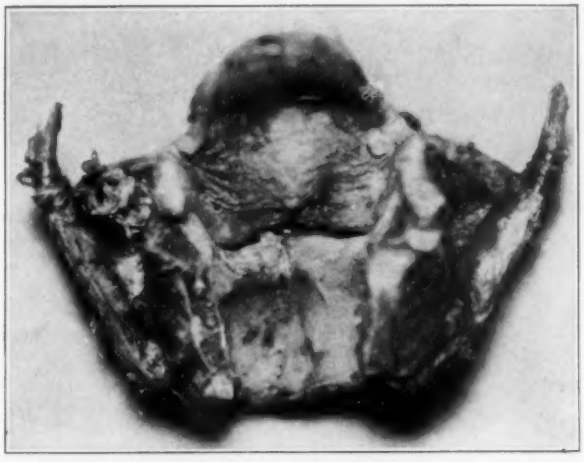

Fig. 19.—Epithelioma of the larynx involving both cords. Laryngectomy was performed.

Fig. 20.—Epithelioma of the larynx, spreading from the ventricle to the epiglottis. Laryngectomy was performed.

dyspnea in 17 cases, owing to the narrowing of the glottic chink by the growth.

Choking with meals or when saliva was swallowed was noted in 26 cases. This may have been due to some involvement of the superior laryngeal nerve filaments, which caused slight anesthesia of the larynx,

or to the direction of food or saliva into the larynx by a deformity of the larynx caused by the growth. This symptom was, of course, particularly noticeable in cases of extrinsic involvement.

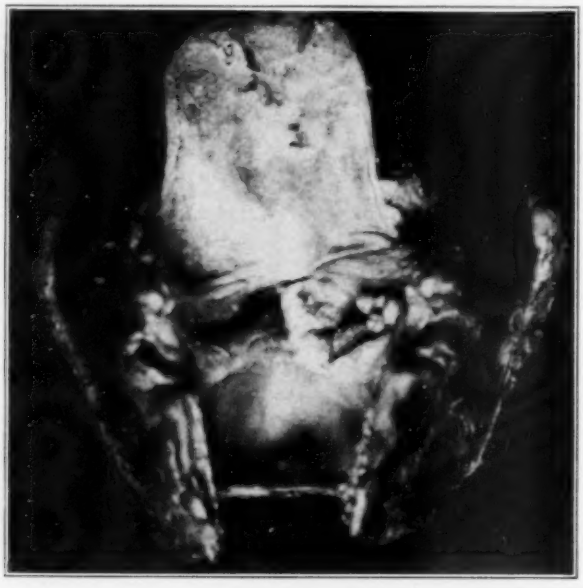

Fig. 21.—Epithelioma of the larynx, on the right cord and the ventricle. Laryngectomy was performed.

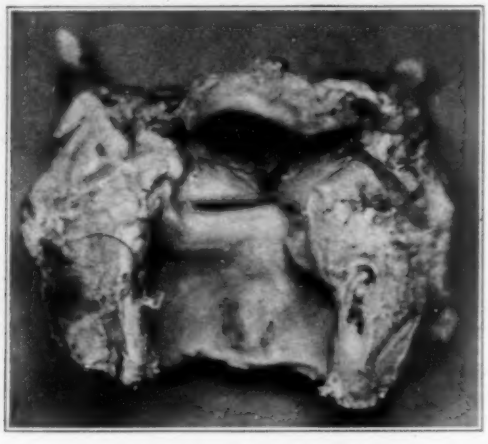

Fig. 22.—Myxosarcoma of the larynx, growing from the right arytenoid cartilage and invading the piriform sinus. Laryngectomy was performed.

Enlargement of the cervical glands, either from infection or by metastatic extension, was observed in 15 cases. This was noticed in cases of advanced disease, for with true chordal cancer lymphatic

invasion is rare. The presence in the piriform sinus of mucus which the patient cannot empty on swallowing accompanied extrinsic cancer in 21 cases.

A cushion behind the larynx, preventing perception of the larynx grating on the cervical vertebrae, was noticed in 3 cases. This is usually present with the postcricoid type but is found also in associa-

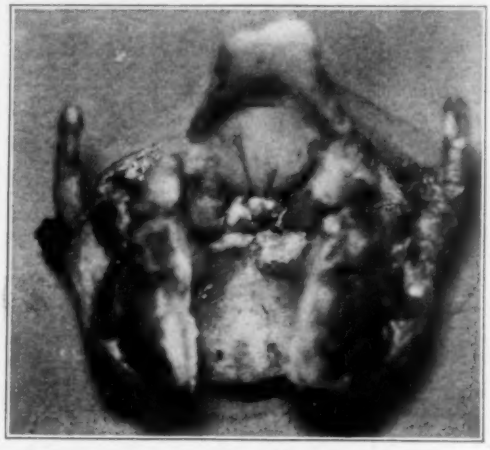

Fig. 23.—Epithelioma of the larynx involving the right cord and invading the epiglottis. Laryngectomy was performed.

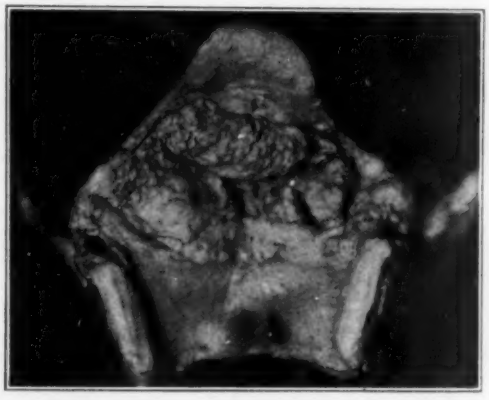

Fig. 24.—Epithelioma of the larynx involving the epiglottis of a female patient. Laryngectomy was performed.

tion with cancer of the posterior wall of the esophagus, a type not included in this series.

Examination showed 20 patients who appeared to have a projecting papillomatous growth; such a growth affected the voice more than the superficial ulcer type, of which there were 47 cases.

The submucous or embedded type of growth was noticed in 25 cases.

Fig. 25.—Epithelioma of the larynx involving the ventricle and the epiglottis. Laryngectomy was performed.

Fig. 26.—Subglottic epithelioma of the larynx (right side), extending upward. Laryngectomy was performed.

Fig. 27.—True subglottic epithelioma of the larynx (left side). Laryngectomy was performed. There was metastasis to the brain and the lung two and one-half years later.

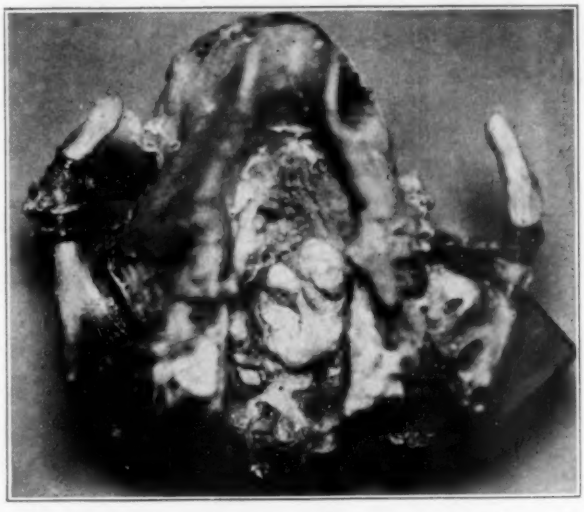

Fig. 28. Epithelioma of the larynx, involving both cords and the subglottic area. Laryngectomy was performed.

Fig. 29.—Epithelioma of the larynx involving both arytenoid cartilages, with infiltration of the cords and the right piriform sinus (grade 3). Laryngectomy was performed in 1934. The patient is still living.

Fig. 30.—Epithelioma of the larynx involving the right aryepiglottic fold. Laryngectomy was performed.

DIAGNOSIS

Diagnosis depends on careful study of the history and of the physical signs already alluded to, proper laryngologic examination and biopsy with histologic study.

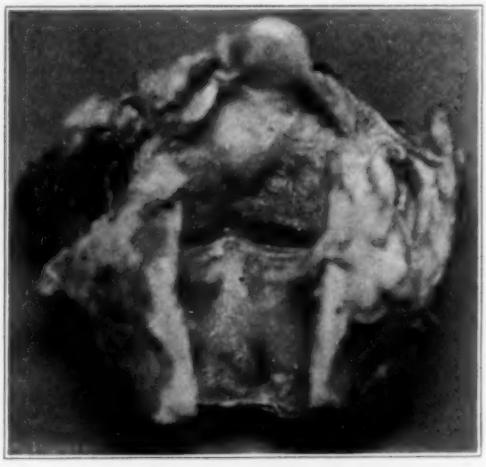

Fig. 31.—Epithelioma of the larynx involving the right piriform sinus, showing ulcerating area. Laryngectomy was performed.

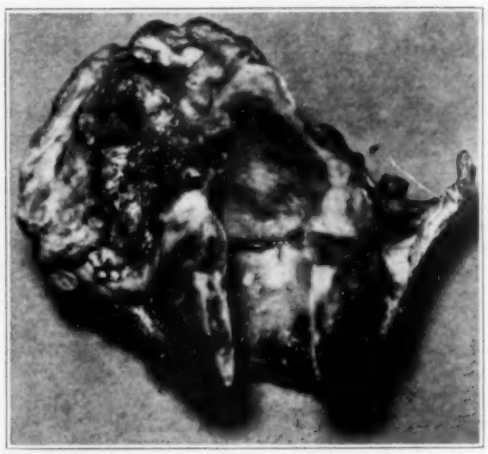

Fig. 32.—Epithelioma of the larynx involving the left aryepiglottic fold to the base of the tongue. Laryngopharyngectomy was performed. There has been no recurrence after two and one-half years.

Eight of 102 patients presented themselves for examination early enough for laryngofissure to be feasible, according to my interpretation of true chordal cancer. In the other 94 patients the disease had

progressed to such an extent that in my judgment total laryngectomy was in order.

Syphilis and tuberculosis are ruled out by proper tests and roentgen studies of the chest. It must be remembered, however, that

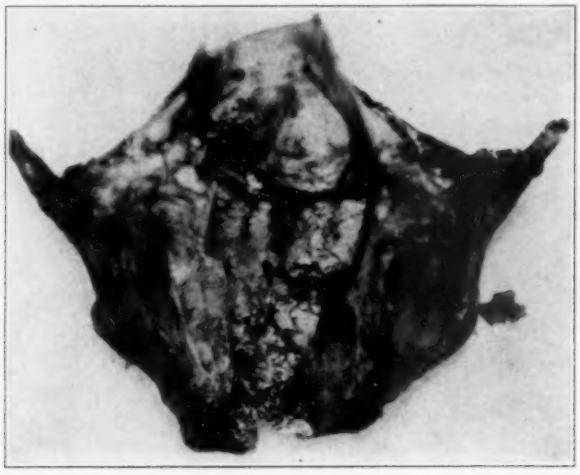

Fig. 33.—Epithelioma of the larynx involving the epiglottis mostly on the right side and the subglottic area on the same side. Laryngectomy was performed.

Fig. 34.—Epithelioma of the larynx (postcricoid or hypopharyngeal). Laryngopharyngectomy was performed. There was a recurrence two years later.

syphilis, tuberculosis and cancer may all be present in the same larynx. Tuberculosis and cancer occurred in 1 of my cases (fig. 35).

Fig. 35.—Epithelioma of the larynx involving the right cord, with tuberculosis of the epiglottis.

Fig. 36.—Postmortem specimen in a case in which the differential diagnosis showed acute edema of the larynx.

Biopsy specimens were taken from all patients, and histologic examination ruled out innocent tumors, such as laryngeal varix and fibroma.

A patient with cancer talks with a strong rough voice, usually without pain. The opposite is true of patients with tuberculosis.

Hoarseness varies from an intermittent to a continuous type, usually being better in the morning, after the patient has rested.

Fig. 37.—Postmortem specimen in a case of syphilis of the larynx. The differential diagnosis showed contractions due to ulcerations.

Cough ranging from a slight tickling sensation to a constant irritating type is present.

Difficulty in swallowing with or without food, increasing dyspnea, which may be followed by stridor and wheeze, increased salivation, and the presence in the piriform sinus of mucus which cannot be emptied spell trouble, especially when associated with other signs, such as blood-tinged saliva or slight hemorrhage and loss of weight. Thirty-nine patients stated that they had lost weight.

Palpation of the neck and the finding of unilateral or bilateral involvement of the glands, plus laryngologic examination with proper illumination to ascertain the type of growth, are important; whether it is projecting into the lumen of the larynx or a superficial ulcer, an embedded tumor or a combination of these is usually unilateral, although if seen late may be bilateral.

The mobility of the cords—whether their action is free or sluggish or whether they are fixed—should be correlated with the physical signs

Fig. 38.—Postmortem specimen of cancer involving the right piriform sinus, the epiglottis and the base of the tongue.

already mentioned, which depend on the site of the lesion. Last but not least, a direction laryngoscopy should be done and a small piece of tissue removed with a biting forceps. Histologic examination of the specimen removed will indicate the type and grade of malignancy and whether the growth is radioresistant or radiosensitive.

PROGNOSIS

Prognosis varies according to the location of the lesion.

In cases of true chordal cancer operation may produce 80 or 85 per cent cures.

In cases of subglottic intrinsic cancer the chance of cure lessens as the distance of the growth from the edge of the vocal cords increases. In other words, the cords are like the timber line: Nothing takes root above, but in the valley vegetation is abundant. So the farther away from the cords, the greater are the growth and lymphatic extension.

The severity of the prognosis increases successively in each of the following types: the epilaryngeal type of cancer, which comprises cancer of the epiglottis, of the aryepiglottic fold, of the arytenoid cartilage and of the piriform sinus, and the hypopharyngeal or postcricoid type.

TREATMENT

In this series of cases true chordal cancer was treated by laryngofissure (table 3).

TABLE 3.—*Operative Results in Eight Cases of Laryngofissure*

Case No.	Age at Operation, Years	Sex	Result
1	48	Female	Alive and well 18 yr. 5 mo. after operation
2	41	Female	Alive and well 12 yr. 8 mo. after operation
3	59	Male	Alive and well 10 yr. 10 mo. after operation
4	54	Female	Alive and well 10 yr. 1 mo. after operation
5	79	Male	Died 6 days after operation (of angina pectoris)
6	61	Male	Growth recurred in larynx 10 months after operation; patient died at age of 62
7	26	Male	Alive and well 8 mo. after operation
8	26	Male	Alive and well 6 mo. after operation

The subglottic type and all extrinsic types were treated by total laryngectomy,[4a] laryngopharyngectomy and, in 1 instance, lateral transthyroid pharyngotomy.[4b]

Preoperative Preparation.—The patient is admitted to the hospital four or five days before operation. During the intervening period a determination of metabolic rate, chemical analysis of the blood and roentgenograms are made. An internist makes a cardiovascular examination and gives his opinion of the operative risk.

Careful attention is given to the cleansing of the mouth with a toothbrush and a 25 per cent alcohol mouthwash before and after meals. The colon is cleansed by administration of a laxative and of a high enema of 1 drachm (3.9 Gm.) of pure sodium bicarbonate to 2 quarts (1.89 liter) of water; this is followed by colonic irrigations

4a. Orton, H. B.: Laryngectomy, Single Stage—Operative Results, Tr. Am. Laryng., Rhin. & Otol. Soc. **38**:81, 1932.

4b. Trotter, W.: Some Principles in the Surgery of the Pharynx, Lancet **2**: 833 (Oct. 17) 1931. Orton, H. B.: Lateral Transthyroid Pharyngotomy: Trotter's Operation for Malignant Conditions of the Laryngopharynx, Arch. Otolaryng. **12**:320 (Sept.) 1930.

with a large colon tube and 2 or 3 gallons (from 7.6 to 11.4 liters) of saline solution. Every other day a modified irrigation with 1 gallon (3.8 liters) of saline solution is given, and sodium bicarbonate, 3 drachms (11.6 Gm.) in twenty-four hours, is given by mouth between meals for three days preceding operation.

The diet during this period is nutritious but of low protein content, including no eggs, milk or beef. Well cooked cereals with cream, chicken, thick soups, spaghetti, rice, bread and butter, vegetables, fruits and juices are given. For twelve hours before operation no food is given; water is permitted up to three hours before operation. Three hours before operation the neck is shaved well back, as well as the upper part of the chest. Soft soap on cotton (with no brush), sterile water and then alcohol are used. No dressing is employed. The bladder is emptied at the last moment.

Laryngectomy.—Anesthesia induced with avertin in amylene hydrate and ether is used. A T incision is made, the transverse line being on a level with the hyoid bone and extending from one anterior border of the sternocleidomastoid muscle to the other and the vertical line from the center of the hyoid bone to the suprasternal notch. These flaps are dissected backward far enough to afford good exposure, the requisite procedure in attacking all forms of cancer. All superficial veins are ligated. Then the superficial cervical fascia is divided in the median line. The sternohyoid muscles are separated on both sides, severed from the hyoid bone and reflected laterally. The thyrohyoid and the sternothyroid muscle are then removed. At this point, if the isthmus of the thyroid gland is high, it is divided and ligated and the gland separated from the trachea at its upper margin. In this procedure the cricothyroid arteries are ligated. The artery and vein of the superior laryngeal nerve are exposed and ligated with three ligatures, the vessels being divided between two of them so that the upper ligated end has two ligatures. The larynx is then rotated to bring the posterior border of the thyroid cartilage into view. The constrictor muscles are cut along this border. The same procedure is carried out on the opposite side.

The larynx is now free except for the posterior wall, where it is in relation with the esophagus.

The trachea is severed just below the cricoid cartilage. A small gauze pack is inserted into the larynx to prevent leakage from the mouth into the wound. The tissue above the severed trachea is packed with gauze to prevent blood from entering the trachea. An anchor suture is placed in the trachea for future use. The Tucker anesthesia tube is placed in the trachea and surrounded firmly with gauze packing, and the anesthesia is then continued through the trachea. The larynx is dissected from the pharynx. The pharynx is then opened, and a large pack is inserted into the pharynx. This is withdrawn through

the mouth after operation. The larynx is removed; the pharyngeal opening is closed with interrupted thread sutures, and just before the last suture is tied the packing is removed from the mouth. A nasal feeding tube is passed through one nostril and guided down the esophagus. The last suture is then tied. Interrupted catgut sutures are placed in the esophagus. The third layer of sutures is in the constrictor muscle of the pharynx. Attention is then directed to the hyoid bone, which is removed by careful dissection to allow a better closure. The trachea is anchored to the skin by means of silkworm gut suture to relieve tension. Black silk thread is used to suture the skin to the trachea. The sternohyoid muscle is then brought to the area behind the trachea, making four lines of sutures over the pharyngeal openings. Counterdrains are placed on both sides of the neck and across the neck at the top of the T. The skin is brought together with skin clips.

Fig. 39.—Patient on whom laryngofissure was performed June 24, 1927. The only one in my series of patients undergoing laryngofissure who stated that the growth was hereditary. The patient is alive and well at present, eleven years after operation.

The laryngectomy tube is made to fit tightly in the trachea by the winding of narrow tape around the upper end. Dressings are applied; the patient is removed to bed, and the postoperative treatment is instituted.

Postoperative Treatment: The gown is changed before the patient leaves the operating room. The bed is warmed and the hot water bag removed before the patient is put into it, and 500 cc. of a 5 per cent solution of dextrose is administered intravenously. A bed suction pump is installed alongside the patient's bed and kept there. A necessary laryngectomy tray with a duplicate tube is always in readiness. The patient's position is changed frequently. Saliva is removed from the mouth by suction and a 25 per cent alcohol mouth wash used. Outer dressings are changed as often as they become soiled. No morphine

TABLE 4.—*Death from Any Cause Within Three Weeks After Laryngectomy*

Case No.	Age at Operation, Years	Period Following Operation, Days	Cause of Death
3	70	2	Diabetes; chronic nephritis
6	54	25	Abscess; gangrene of lung
11	75	5	Pneumonia
49	64	6	Pneumonia; abscess of lung
77	28	21	Meningitis; septic pneumonia; Wassermann reaction 4 plus

TABLE 5.—*Death from Other Causes in Cases of Laryngectomy*

Case No.	Age at Operation, Years	Age at Death, Years	Period After Operation		Cause of Death
			Yr.	Mo.	
4	72	85	12	11	Apoplexy
17	48	53	5		Injury by train
23	63	65	2	6	Apoplexy
26	38	40	2	3	Sudden death by accident
33	76	82	6		Coronary thrombosis
41	60	60		2	Tuberculosis
45	62	66	4	2	Apoplexy
48	49	49		4	Hemorrhage
86	71	71		1	Gastric ulcer; perforation

TABLE 6.—*Patients Alive and Well After Laryngectomy*

Case No.	Age at Time of Operation, Years	Sex	Period Since Operation		Case No.	Age at Time of Operation, Years	Sex	Period Since Operation	
			Yr.	Mo.				Yr.	Mo.
5	50	Male	12	8	62	63	Male	3	6
7	55		12	3	63	36	Female	3	6
12	50		10	7	64	45	Male	3	5
15	48		10		65	37	Female	3	5
18	66		9	6	66	52	Male	3	5
19	49		9	7	67	48		3	1
21	43		8	3	68	52		2	8
22	70		8	5	69	56	Female	2	8
24	41		8	3	71	61	Male	2	6
25	54		8	3	72	63		2	4
27	54		7	11	73	68		2	3
28	67		7	10	74	49	Female	2	3
30	60		6	8	75	53	Male	2	1
31	49		7	5	76	39		2	1
32	52		8		79	42	Female	1	7
34	60		6	6	80	67	Male	1	6
35	46		6	4	81	56		1	5
36	63		6	3	82	51		1	4
39	75		5	9	83	59		1	4
44	55		5	3	84	61		1	4
46	49		5		85	46		1	1
47	40		5		88	62			9
50	47		4	10	89	71			5
55	60		4	3	90	69			5
57	52		4	2	91	40	Female		4
58	40		4		92	61	Male		4
59	58		3	11	93	63			1
60	46		3	10	94	55		2	8
61	29		3	9					

is given. The patient should be out of bed the day after the operation. The diet should be of high caloric value. Special nursing is required.

Complications: The immediate complications following operation are listed in table 4. Three of the patients to die in this period were among the first 11 operated on.

Among later complications, hiccup became distressing in 3 cases. Medication did not seem to have any effect on the spasm. The only beneficial result was obtained by partial withdrawal of the feeding tube from the esophagus and its reinsertion to half the former distance. In this series there was little postoperative vomiting, but in these 3 cases vomiting started early, suggesting the possibility that the lower end of the feeding tube became curved on itself in the esophagus.

Fig. 40.—Recent photograph of laryngectomized patients attending a speech class.

Two patients had severe hemorrhage. One, a man, was sitting in a chair playing cards with his nurse three weeks after operation when he suddenly had a severe hemorrhage. The other patient, a woman with hypertension, had a severe hemorrhage two weeks after operation. In both instances bleeding was from the superior thyroid artery. The value of specially trained nurses for patients who have undergone laryngectomy is hereby emphasized, for such nurses were able to control the hemorrhage by pressure until the wound was opened and the bleeding points ligated. Both of the patients are alive and well at the present time.

Erysipelas developed in 1 patient two weeks after operation. He made an uneventful recovery but died five months later of a recurrence of the tumor.

Speech After Laryngectomy and Its Psychologic Aspects: I am convinced that all patients can acquire a pharyngeal voice if they

wish to. Some of my patients begin with the Mackenty [5] artificial larynx for practice in forming the words, but later all discard the instrument.

To assist these patients in the rehabilitation of speech, my office nurse, Miss M. A. Lumbreyer, and Mrs. H. Weiss, my secretary, with my sanction, instituted a class in speech. The speed with which these patients acquired the pharyngeal voice was indeed a revelation. Their close association in the class was a great incentive for the members to try to surpass each other. (Figure 40 is a recent picture of some of the class patients.) The attendance at this class averages between 15 and 20 patients at each lesson.

Specially trained nurses are in attendance for operations and for after-care. It is essential in cases of laryngectomy that the attending nurse have a cheerful disposition, for this is the most important factor in tiding the patient over the usual period of depression which comes on about the third day. The number of visitors is limited to members of the immediate family.

Getting the patient out of bed the day after operation is most valuable psychologically, in that it raises the morale materially. After such an operation the patient naturally assumes that he will be bedridden for some time, and he is much surprised to be permitted out of bed for fifteen minutes of the next morning and afternoon and for increasing periods daily thereafter. Despite their handicap, not 1 patient has taken the attitude that life is not worth living.

Consider for a moment the case of an Italian patient who, though he could speak English, could neither read nor write it. When I removed his larynx, this man certainly had every reason to be despondent; but, strange as it may seem, he was able to talk before he left the hospital and at the present time has one of the best possible pharyngeal voice. This is one example among many that could be cited.

With all this in mind, I cannot agree with those who state that a laryngectomized patient finds life scarcely worth living.

Laryngofissure.—Laryngofissure was done in cases in which the growth was limited to one cord, freely movable and of short duration. In most of these cases the growth was so small that it was almost entirely removed for biopsy. The results were gratifying (table 3).

It hardly seems necessary to describe laryngofissure in detail before this association, as the members are all familiar with the technic described by Thomson [6] and by Jackson,[1] which has been carried out in this series.

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5. Mackenty, J. E.: Malignant Disease of the Larynx: Rare Type, Premalignant Conditions and Conditions Simulating Malignancy, Arch. Otolaryng. **20**:297 (Sept.) 1934.

6. Thomson, St. C.: Cancer of the Larynx, New York, The Macmillan Company, 1930.

Figure 39 shows a minister who underwent laryngofissure eleven years ago; he carried on his activities until his retirement last year. I saw the patient two weeks ago; he is looking remarkably well and there has been no recurrence.

Irradiation.—Sixteen patients had postoperative irradiation with varying success. In some cases it was done as a precautionary measure. In others it followed resection of glands if they were low in the neck. Preoperative irradiation was given to 2 patients.

TABLE 7.—*Recapitulation*

Laryngectomy (including lateral transthyroid pharyngotomy in 1 case)—94 patients

57 alive and well
5 died within three weeks of operation
23 had recurrence
9 died from other causes

57 are alive and well
9 died from other causes

66 successful

5 alive and well under 1 year
30 alive and well 1 to 5 years
18 alive and well 5 to 10 years
4 alive and well 10 years and over

Laryngofissure—8 patients

6 alive and well
1 died within three weeks of operation of coronary disease
1 had recurrence

2 alive and well under 1 year
4 alive and well from 10 to 18 years

Combined results—102 patients

63 alive and well
6 died within three weeks of operation
24 had recurrence
9 died from other causes

7 alive and well under 1 year
30 alive and well 1 to 5 years
18 alive and well 5 to 10 years
8 alive and well 10 to 18 years

63

63 alive and well + 9 (died from other causes) = 72 successful

CONCLUSIONS

Early recognition and diagnosis of cancer of the larynx makes possible cure by surgical measures—laryngofissure, laryngectomy or lateral transthyroid pharyngotomy.

Since there is recurrence in 50 per cent of cases of subglottic cancer, I believe total laryngectomy is preferable to laryngofissure in its treatment.

I cannot agree with those who say that laryngectomy is a mutilating operation.

In my experience laryngectomized patients have not been despondent; they have been a happy lot, getting a great deal out of life.

OBJECTIVE TINNITUS AURIUM

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The origin of tinnitus is not definitely known. That it must arise from abnormalities in the auditory system, either locally or in the nerve mechanism, is obvious. Two types of tinnitus are differentiated—the subjective type, which is heard only by the patient, and the objective type, which can be heard also by an observer.

There will be considered here only the objective type, which may be either vascular or muscular in origin. The vascular type occurs most commonly in the adult. The muscular type is less common and is found particularly in children. The vascular type of objective tinnitus is heard with the aid of a stethoscope or an auscultation tube, while the muscular variety can often be heard by an observer at a distance of from 1 to 2 feet (30 to 60 cm.) from the patient.

REVIEW OF LITERATURE

Friedmann [1] cited Politzer as reporting a case in which he had observed rhythmic movements of the soft palate, associated with separation of the anterior and posterior walls of the eustachian tube, synchronously with an audible clicking sound. Politzer also observed a synchronously associated movement of the soft palate. Friedmann [1] ascribed the noises he heard in a 9 year old girl, in the absence of demonstrable disease, to contractions of the muscles about the eustachian tube. He drew this inference from observing a rhythmic movement of the soft palate. The condition was considered by him to have a nervous or a hysterical genesis. He quoted Kaiser to the effect that the noise is a sound produced by contractions of the tensor tympani muscle.

Jones and Knudson [2] also described a case of objective tinnitus in which they observed a spasmodic contraction of the palatal muscles. They explained the clicking sound by the forcible opening of the

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Submitted as a candidate's thesis to the Chicago Laryngological and Otological Society, in April 1934.

From the Department of Laryngology, Rhinology and Otology, the University of Illinois College of Medicine.

1. Friedmann, C.: On Objective Tinnitus, Ztschr. f. Ohrenh. **46**:373, 1904.

2. Jones, K. H., and Knudson, V. S.: Certain Aspects of Tinnitus, Particularly the Treatment, Laryngoscope **38**:597, 1928.

eustachian tube with each contraction, referring to a condition of this type as pseudotinnitus because the noise is merely conducted to the ear by way of connecting or contiguous structures.

Kafka,[3] in an exhaustive article on tinnitus, insisted that objective sounds may be produced by violent contraction of the stapedius or of the tensor tympani muscle. He stated that this condition is associated with neurotic and neurasthenic persons. In other cases he ascribed the sounds to aberrations in the circulation resulting from aneurysms of the carotid artery. These sounds are of low medium pitch, are synchronous with the heart beat and may be stopped by compression of the carotid arteries.

Brieger [4] reported a case in which he stated that the noises were produced by simultaneous irritation of the tensor tympani and the tensor veli palatini muscle. Division of the tensor tympani muscle is his case arrested the noise for a short time, but subsequently it returned, louder and more distinct than before, and was associated with spasm of the soft palate. Brieger stated that contraction of the tensor tympani muscle alone is too delicate a movement to produce so intense a noise. Weil [5] made the observation that in cases of severe anemia objective tinnitus may occur as a "venous hum," originating in the vessels of the neck and transmitted to the ear. Yates [6] reported a case of the vascular type of tinnitus in which the noise could be stopped by pressing lightly on the soft tissues behind the angle of the jaw or by turning the patient's head toward the affected side.

Iglauer [7] reported 4 cases of objective tinnitus in all of which the condition arose from a vascular cause. He expressed the belief that the sounds originated in the region of the bulb of the jugular vein. Tinnitus disappeared in the majority of cases when the head was turned in certain directions. He concluded that rotation of the head has some effect on the circulation in the jugular vein and its bulb, as the carotid artery is too rigid to be affected by turning. In his opinion, the carotid artery has no influence on this type of tinnitus. In 2 of his cases tinnitus was temporary. In case 2 here reported the tinnitus began in the early months of pregnancy and ceased spontaneously about the seventh month;

3. Kafka, M. M.: Tinnitus Aurium: Etiology, Differential Diagnosis, Treatment and Review of Twenty-Five Cases, Laryngoscope **44**:515, 1934.

4. Brieger, O.: Klinische Beiträge zur Ohrenheilkunde, Wiesbaden, J. F. Bergmann, 1896, p. 140.

5. Weil, A.: A Case of Objective Tinnitus Aurium, Laryngoscope **14**:202, 1904.

6. Yates, D. G.: Case of Objective Tinnitus Aurium, Ann. Otol., Rhin. & Laryng. **19**:734, 1910.

7. Iglauer, S.: Objective Tinnitus Aurium, Arch. Otolaryng. **18**:145 (Aug.) 1933.

in case 3 it was attributed to endocrine and vasomotor disturbance arising during the menopause, and relief was obtained by the use of whisky.

Bárány [8] divided tinnitus into subjective, objective and combined types as a condition in which an objective sound is present but is too weak to be heard by an observer. He concluded that examples of this type of tinnitus result from abnormal pulsations in the small arteries about the facial ridge or from voluntary contractions of the stapedius muscles, produced by pulling back the lower jaw after opening the mouth. Sudden turning of the head to one side may produce a similar noise. Passow,[9] Hamburger [10] and Iglauer [7] reported cases of extracranial aneurysm involving the temporal and occipital arteries. In all cases cessation of the tinnitus was obtained by destroying the vessels.

In the following cases of the objective type of tinnitus the several variations are illustrated and certain features of particular interest are presented.

REPORT OF CASES

CASE 1.—A boy aged 9 had had chronic suppurative otitis media for seven years. The disease began as a complication of scarlet fever, at the age of 2 years, and persisted, with the usual periods of exacerbation and remission. No aural therapy had been given. Except for tinnitus, there were no subjective symptoms. Examination showed that the tonsils were hypertrophic. The left tympanic membrane appeared normal; the right tympanic membrane showed a large central perforation, through which a small amount of odorless pus drained into the external auditory canal. The diagnosis was obviously chronic otitis media, without osseous necrosis. During examination a peculiar clicking, rhythmic noise was heard coming apparently from the right ear. This rhythm was not synchronous with the apex beat and the radial pulse. It occurred at the average rate of 100 a minute. The ticking was constant, and inquiry revealed the fact that three years previously the boy had told his parents that he heard a clock tick in his ear. No attention was given the matter, although the noise was evident to the parents when they approached the boy's right ear. Inflation of the eustachian tube produced no change in the rate or rhythm of the sound. At times slight movements were observed in the soft palate, but no muscular contractions were seen about the face. A moderate degree of conduction deafness was revealed on the right side. Digital examination showed a large amount of adenoid tissue in the postnasal space.

Tonsillectomy and adenoidectomy were performed. The discharge ceased after two months of conservative treatment; the large perforation remained open. At present (April 1934) there has been no change in the tinnitus, though the ear is dry after a period of twelve months. The patient is not annoyed by the ticking; on the contrary, he considers it rather interesting to have a "watch in his ear."

CASE 2.—A white woman aged 45 was under treatment for one year for hypertension. There were repeated attacks of epistaxis, until one such attack required

8. Bárány, R.: Zur Aetiologie, Therapie und Theorie der objective-subjectiven Ohrgerüsche, Acta oto-laryng. **16**:311, 1931.

9. Passow, A.: Objective Ohrgerüsche, Internat. Zentralbl. f. Ohrenh. **8**:511, 1910.

10. Hamburger, L. P.: Head Murmurs, Am. J. M. Sc. **181**:756, 1931.

the use of a postnasal pack. She was admitted to the hospital two days later, after which she was first seen by me. At this time the pack was removed, and the bleeding was stopped by cautery. The patient was discharged from the hospital in good condition. Acute suppurative otitis media developed in the left ear five days later. Owing to the absence of pain and to the fact that little discomfort was felt, the patient did not seek medical aid at this time, and the tympanic membrane ruptured spontaneously. Three days after the onset of the discharge from the ear the patient again consulted me, complaining that she could not sleep and was extremely nervous because of a pounding noise in the left ear. This seemed to keep time with the heart beat and was present whether she was in an upright position or was recumbent. Its intensity had not varied for twenty-four hours. Examination of the left ear disclosed a small perforation in the lower anterior part of the ear drum. A serosanguineous material was discharged through the perforation apparently under great pressure. Deafness was present in the left ear. A strong rhythmic sound was heard through the stethoscope all along the left side of the neck. With the auscultation tube the noise was observed to be intensified in the left ear and was synchronous with the heart beat. Turning of the head to either side brought no change in the intensity of the sound. Compression of the left carotid artery decreased the sound considerably. Sedatives were prescribed. Subsequent daily examinations revealed a gradual decrease in the intensity of the sound. After the fifth day it could no longer be heard by the observer, but not until the seventh day had the subjective tinnitus disappeared. The ear became dry after two weeks, and normal hearing returned. The blood pressure of the patient, taken daily while she was under observation, showed the following variations: January 18, 175 systolic and 90 diastolic; January 19, 160 systolic and 90 diastolic; January 20, 132 systolic and 80 diastolic; January 21, 155 systolic and 90 diastolic; January 22, 128 systolic and 80 diastolic; January 23, 148 systolic and 85 diastolic. Subsequently the systolic pressure remained about 150.

The proximity of the carotid canal to the middle and internal ear probably played a role in the production of this type of tinnitus. The inflammatory process in the middle ear may directly or indirectly involve the surrounding structures to a sufficient extent to allow the pulsations from that vessel to be transmitted strongly to the ear. The sound was of vascular origin, since it was synchronous with the heart beat. This transitory type of objective vascular tinnitus has not previously been reported in the literature.

Case 3.—A white woman aged 51 consulted Dr. Francis L. Lederer because of deafness, tinnitus and pain in the right ear, of many years' duration. On two occasions the ear drum was incised by physicians because of the findings, and each operation resulted in intractable hemorrhage, necessitating packing. The first inspection of the ear drum revealed nothing unusual, and the subjective noise in the ear on which the patient insisted was thought to have purely a functional basis. However, on closer inspection of the drum a dark red area was observed, involving the posterior superior quadrant and most of Shrapnell's membrane. The patient was so insistent that the tinnitus was audible that a diagnostic tube was placed in the external canal and a definite blowing sound was heard. With the aid of a magnifying otoscope, pulsations of the discolored portion of the tympanic membrane were readily seen. Dr. Joseph Beck also examined the patient and verified the findings already described.

Roentgenograms of the mastoid revealed rarefied areas. In view of the progressive deafness and the increasing severity of the other symptoms, an exploratory

operation was undertaken. Considerable difficulty attended mastoidectomy because of excessive hemorrhage. The bony trabeculae of the mastoid were intact, but each cell was filled with a soft granulomatous mass, which became the source of almost uncontrollable bleeding. The mastoid process, the antrum and the upper portion of the middle ear were all filled with this tissue. Its exact origin could not be determined, owing to the extreme amount of bleeding. A radical mastoidectomy was performed; a plastic and a firm pack completed the operation.

About four days after the operation facial paralysis appeared. Repeated attempts were made to remove the pack, in order to relieve the pressure which appeared to cause the palsy. The removal of the pack after two weeks was still attended by bleeding. Not until skin flaps had been brought down and the area covered completely with skin did the hemorrhage cease. The facial paralysis eventually disappeared, as did the subjective tinnitus.

Eight years after the operation the patient is free from subjective tinnitus. However, a distinct bruit can still be heard with the aid of an auscultation tube.

COMMENT

It is generally agreed that objective tinnitus may be produced in either of two ways; namely, by disturbances of the vascular system about the head and neck or by contractions of the muscles around the eustachian tube. The muscular type of tinnitus always produces a noise characteristically regular and rhythmic, either clicking or ticking, at the rate of about 100 per minute.

Bárány's [8] combined objective-subjective type of tinnitus is an unnecessary subdivision, for, by definition, if the sounds cannot be heard on examination the tinnitus should be classified as subjective.

The origin of the sounds heard in the muscular type of objective tinnitus has been explained in a number of ways. The suggestion that the noise may be the result of friction of the ossicles or of vibration of the drum membrane does not appear to be tenable. Contractions of the stapedius or of the tensor tympani muscle seems to be too delicate an action to produce noises audible to an observer. The only explanation of the origin of these sounds for which definite evidence has been offered ascribes it to the clonic contractions of the muscles about the eustachian tube and the soft palate; the opening and closing of the eustachian tube, with the accompanying alternate separation and contact of the two moist surfaces, best explains the peculiar clicking sound. Hysteria and neurasthenia have been hypothecated as predisposing or contributing factors. Since such conditions are uncommon in children and since it is in children that this type of tinnitus always occurs, this explanation is not plausible. Some cases of this type of tinnitus have been reported in which the symptoms disappeared and reappeared, but in case 1 the ticking has been constant on repeated examinations and the patient is unable to control it. So far as I have been able to determine, no case has been reported in which it was possible to arrest the noise permanently, but the absence of instances of the muscular type of tinnitus in adults shows that a spontaneous cure probably occurs as the child grows up.

The vascular type of objective tinnitus, whether of arterial or of venous origin, is the more common and is heard only with the aid of the stethoscope or the auscultation tube. Its most frequent causes are: (1) aneurysms, including arteriovenous aneurysms, both intracranial and extracranial; (2) hypertension; (3) vascular tumors of the brain and the ear; (4) coarctation of the aorta; (5) severe anemias; (6) pregnancy; (7) acute inflammatory disease of the ear, and (8) vasomotor and endocrine disturbances.

In the arterial type of objective tinnitus the sounds are synchronous with the heart beat; if the carotid artery is the direct cause, they may be eradicated or modified by its compression. Nonpulsating noises which are soft and humming are venous in origin and are found in cases of sever anemia. The tinnitus in Iglauer's [7] cases must have been arterial in origin, since he reported that the sound was rhythmic, synchronous with the heart beat and modified or eliminated by pressure on the carotid artery.

The cure of the tinnitus in Lederer's case indicates that he removed the part of the tumor in close proximity to the structures of the inner ear which had caused the subjective tinnitus, but left a pulsating mass sufficient in size to permit the sounds to be heard with the auscultation tube. Treatment of the vascular type of tinnitus depends on the cause. Aneurysms are subjected to such forms of treatment as are feasible in the particular case. Ligation of the carotid artery has been advised to relieve tinnitus, but in the vast majority of cases this method of treatment has not had a favorable result. Further, since the method carries with it a relatively high mortality and morbidity in adults, it has a limited field of application. In the venous types of tinnitus, usually due to anemia, the tinnitus ceases with improvement of the underlying pathologic condition and with restoration of the proper constituents of the blood. Elimination of the cause in the transitory type of tinnitus, such as that associated with pregnancy and inflammation, usually results in a permanent cure. The use of the stethoscope and the auscultation tube as a routine by otologists in examination of sufferers from tinnitus would, I believe, reveal many cases of unsuspected objective tinnitus.

SUMMARY AND CONCLUSIONS

Three cases of objective tinnitus are reported. Similar cases described in the literature are reviewed.

Objective tinnitus may be either vascular or muscular in origin.

Spasmodic contractions of the eustachian tube are the chief causative factors in the muscular type of objective tinnitus; the immediate cause is the separation of the moist surfaces of the eustachian tube.

The vascular type of tinnitus is caused by the preternatural transmission of arterial or venous impulses to the ear.

Dr. Francis L. Lederer placed the records in his case at my disposal.

BRONCHIAL ASTHMA AND NASAL ALLERGY

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NEW YORK

I have chosen bronchial asthma as my subject so as to avoid becoming involved in a controversy regarding strictly otolaryngologic matters, with which I have had little experience and on which I certainly could contribute nothing in a group such as this. A brief general review of the internist's point of view in the classification and management of asthma may be of some interest.

The importance of pathologic conditions of the nose in asthma cannot be emphasized too much. The exact relation between nasal and sinal findings and asthma is often difficult to determine. They may bear no relation to each other; on the other hand, both may be of allergic origin and caused by the same allergen, as in pollen asthma associated with hay fever, or they may be due to entirely unrelated substances. What constitutes proper procedure in the management of the condition in individual cases is not always easy to decide; there is considerable difference of opinion, and the problem requires the careful expert consideration of both the rhinolaryngologist and the allergist-internist. I say allergist-internist because I consider allergy an integral part of a major specialty. I do not think that one can competently treat the many clinical manifestations of hypersensitiveness as related to the various systems of the body from a strictly so-called allergic standpoint without either adequate training in the particular field concerned in the allergy or close cooperation with a specialist in that field. Asthma requires the attention of an internist well trained in allergy; and in the cases to be discussed, in which pathologic conditions of the nose play a prominent part, the internist must work with a rhinologist.

CLASSIFICATION

In discussing asthma, one of the most difficult things to do and yet the first thing that one must do is to decide whether or not one is dealing with true uncomplicated asthma. Much confusion at times arises in differentiating paroxysmal dyspnea caused by a foreign body in a bronchus, pressure on the trachea at some point, marked pulmonary fibrosis sufficient to displace the trachea or enlarged hilar lymph nodes from

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true bronchial asthma. Here another difficulty is encountered: that of agreeing on a definition, whether asthma should be considered as a clinical entity or merely as a symptom of any number of dysfunctions. I am going to consider bronchial asthma as a clinical entity and define it as a bronchial neurocellular syndrome characterized by recurrent attacks of paroxysmal dyspnea. It may be classified in any number of ways, none of which is entirely satisfactory; some classify it as allergic or nonallergic. This I do not like, because in the present state of

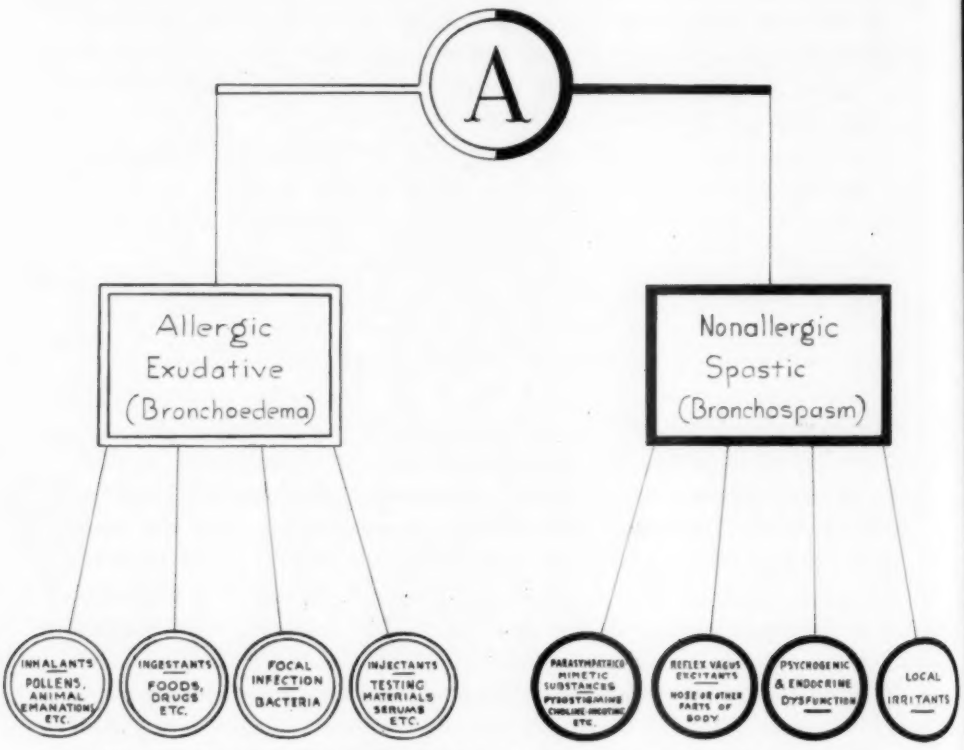

Fig. 1.—Diagrammatic representation of pathologic classification of asthma.

knowledge regarding allergy—and particularly regarding sensitization tests, about which I shall say more a little later—the large number of cases put under the nonallergic heading are often placed there because it has been impossible to demonstrate an allergic relationship, which does not necessarily mean that the symptoms are not due to an allergen but indicates only that the allergen has not been found. Some classify asthma as extrinsic or intrinsic; this division also I do not like. I prefer a classification that attempts to convey to one's mind something suggestive of the actual pathologic condition. I have divided asthma into two large types, (1) bronchoedematous and (2) bronchospastic.

The bronchoedematous type, in which there is edema of the bronchial mucosa, includes asthma due to sensitization to an allergen; truly non-allergic asthma due to remote stimulation by some other excitant, such as a pathologic condition of the nose, the effects of heat and cold or emotion, manifests not bronchoedema but bronchospasm.

That actual bronchospasm may occur as a result of stimuli originating in some distant part of the body has been adequately demonstrated; the fact that swelling of the bronchial mucous membrane occurs in sensitive subjects also has been shown repeatedly. I do not mean to imply that in the bronchospastic type there is no bronchoedema and vice versa, for I can readily see that swelling of the bronchial mucous membrane with interruption of proper local function may result almost immediately in bronchospasm and, conversely, that spasm would soon be followed by edema. Therefore, in most cases in actual practice the condition is of mixed type pathologically, even though etiologically it belongs fundamentally to one type or the other.

DIAGNOSIS

It seems unnecessary at this late date to emphasize the necessity of a careful taking of the history, thorough physical examination and complete laboratory and roentgen analysis, as well as tests of sensitization. In this connection, however, there is just one point which I think has received and is still receiving entirely too much emphasis. That is heredity. A great deal has been written about heredity in allergy, and some authors have expressed the belief that the presence or absence of allergy among the antecedents is an important indication of the category in which to place a condition. I have taken exception to this on the ground that it leads to error. It is impossible to obtain reliable information from a patient regarding the incidence of allergy among his or her antecedents. Some of the first published statistics on heredity in allergy included as evidence of allergy only hay fever and asthma; later reports included certain types of eczema, then urticaria, migraine and gastrointestinal disturbances, and now, when nearly every system and tissue in the body is recognized as a possible seat of allergic phenomena, it seems to me that practically all persons are potentially allergic in one form or another. Even a casual perusal of figure 2 will, I think, convince the reader of the undependability of statistics on heredity in allergy.

SENSITIZATION TESTS

The development of the cutaneous test as a means of determining specific hypersensitiveness has, of course, done much to enhance knowledge of and stimulate interest in this field. It is important that every practitioner should fully appreciate the fallacies of these tests, so that

he may more fully grasp their true significance and value. One must not condemn the entire field of clinical allergy and underestimate its importance merely because of the inadequacies and inaccuracies of sensitization tests as performed today. There is no question but that there are many pitfalls; one frequently observes positive cutaneous reactions to substances having clinically nothing to do with a patient's symptoms, and one may fail to obtain reactions to substances known to be important etiologic factors. Occasionally one obtains a positive reaction in one area of skin and a negative reaction in another. Cases of remarkably localized sensitivity are interesting; for example, a physician with sea-

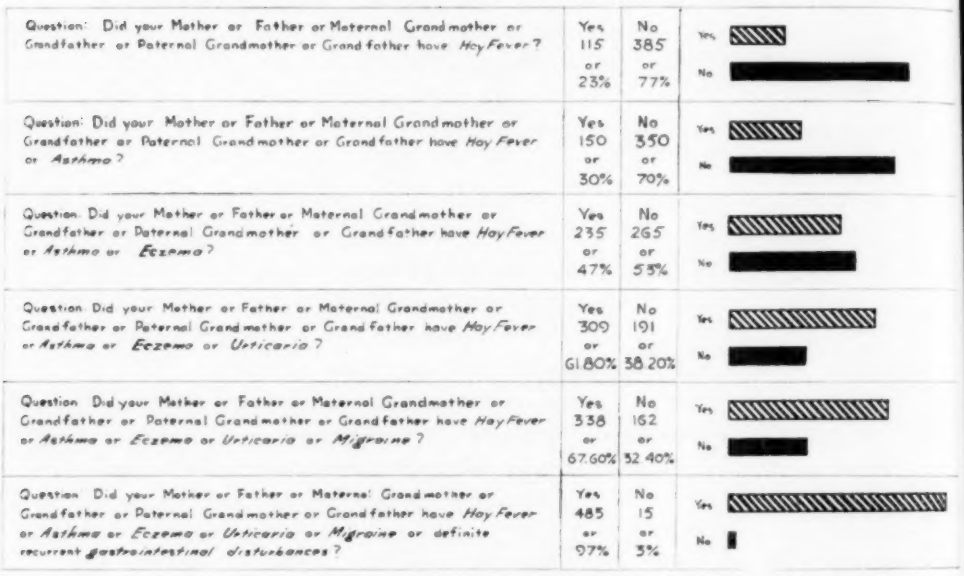
Question: Did your Mother or Father or Maternal Grandmother or Grandfather or Paternal Grandmother or Grandfather have Hay Fever?
Yes 115 or 23%
No 385 or 77%
Question: Did your Mother or Father or Maternal Grandmother or Grandfather or Paternal Grandmother or Grandfather have Hay Fever or Asthma?
Yes 150 or 30%
No 350 or 70%
Question: Did your Mother or Father or Maternal Grandmother or Grandfather or Paternal Grandmother or Grandfather have Hay Fever or Asthma or Eczema?
Yes 235 or 47%
No 265 or 53%
Question: Did your Mother or Father or Maternal Grandmother or Grandfather or Paternal Grandmother or Grandfather have Hay Fever or Asthma or Eczema or Urticaria?
Yes 309 or 61.80%
No 191 or 38.20%
Question: Did your Mother or Father or Maternal Grandmother or Grandfather or Paternal Grandmother or Grandfather have Hay Fever or Asthma or Eczema or Urticaria or Migraine?
Yes 338 or 67.60%
No 162 or 32.40%
Question: Did your Mother or Father or Maternal Grandmother or Grandfather or Paternal Grandmother or Grandfather have Hay Fever or Asthma or Eczema or Urticaria or Migraine or definite recurrent gastrointestinal disturbances?
Yes 485 or 97%
No 15 or 3%
Yes
No

Fig. 2.—Five hundred patients varying in age from 15 to 60 and giving a clear-cut history of seasonal hay fever and positive reactions to cutaneous, inhalation and passive transfer tests with one or more pollens were carefully questioned regarding allergy in the mother, the father and the maternal and paternal grandparents. The answers have been tabulated in six groups, which clearly show the inaccuracy of statistics relating to heredity in allergy.

sonal asthma had negative reactions to cutaneous, ophthalmic, passive transfer and inhalation tests in the nose. However, this patient reacted immediately to the inhalation of ragweed pollen directly into the lungs.

MANAGEMENT

As I stated before, in the majority of cases the condition is of mixed type; therefore, the average patient requires care from both the allergic and the nonallergic angle.

Obviously, further contact with an offending allergen, once it has been definitely established, should be avoided. A careful inspection of the patient's home is helpful; it is amazing to note the queer and unsuspected sources of exposure and contact which one may discover by a systematic and thorough search. For example, a patient sensitive, let me say, only to ragweed may have severe attacks of asthma at odd times of the year due to exposure to pyrethrum, which belongs to the same botanic family as ragweed. The substance is found in most insecticides, such as flit, and is used to spray the upholstery in automobiles, draperies, and upholstered chairs. Patients sensitive to cattle hair are exposed to this allergen in the form of ozite, which is a matting or padding to be placed under carpets and rugs and which is made almost entirely of tightly pressed cattle hair. Children's toys are often made of cattle hair or rabbit hair. I could cite any number of interesting examples of unusual forms of exposure to various allergens. A point of practical importance is that at times a patient will give a positive reaction and be shown to be sensitive to feathers in his own pillow and still give a negative reaction to a stock extract. Why this is I do not know, but it does happen; therefore, I usually test with extracts of materials collected from the patients' home as well as with the stock extracts. A growing interest in molds and fungi is being shown; therefore, this source of sensitization should not be overlooked.

The intestinal tract must be kept free; this is of great importance with all types of asthma.

Time does not permit me to discuss my observations on the value of medication with hydrochloric acid, with peptone and with calcium, of intratracheal administration of iodized poppyseed oil, of roentgen irradiation, of bronchoscopic treatment and of other nonspecific procedures; but I should like to say just a few words about the use of iodides. It has been repeatedly stated that it is unnecessary to give iodides intravenously, as they act just as efficaciously when given by mouth. I must disagree with this opinion. I am convinced that iodides administered intravenously in the form of sodium iodide give better results in the treatment of asthma than do iodides given by mouth. Furthermore, for several years I have administered large doses of iodide intravenously once or twice a week, giving as much as 250 cc. of a 4 per cent solution. This represents 10 Gm. of sodium iodide, as against the usual dose of 2 Gm. The results have been extremely gratifying, and in not a single instance has there been any untoward effect.

I must now pass to the management of nasal and sinal pathologic conditions and asthma. If there is any free pus in the sinuses, naturally there is no question but that adequate measures should be instituted to eliminate it. When the pathologic picture consists of, let me say, a

thickened membrane in the antrum or the presence of polyps in one or both antrums, then the decision is not so simple or so cut and dried. Some competent otolaryngologists insist that in such cases operative measures should not be taken, because the patient is generally allergic and if one eliminates the offending allergen the thickened membrane and polypoid tissue recede. It is my humble opinion that otolaryngologists have gone from one extreme to the other. Formerly operative measures were taken in all these cases, and allergy was given no recognition. Now allergy is being accorded a great deal of importance, and many patients with involvement of this type who will not get well except by operation are not operated on but are kept on rigid diets and given long series of injections of numerous allergenic extracts. In cases of asthma in which true polyps are present, I am convinced that satisfactory results will not be obtained merely by eliminating offending allergens or by attempts at hyposensitization. The pathologic condition must be corrected surgically.

It is interesting to note that frequently antral washings may be sterile while cultures of the lining membrane yield pure growths of one or another organism to which the patient may have become allergic and to which one obtains definitely positive cutaneous reactions. In cases in which this is true examination of the tissue often shows a marked increase in eosinophils and the eosinophils in the circulating blood are as a rule increased. In these cases administration of autogenous vaccines after operation gives the best results. When cultures of tissue are sterile and there is no local or general eosinophilia, no benefit may be expected from vaccines. When culture of tissue yields a positive bacterial growth but there is no local or general eosinophilia and the cutaneous reaction to the autogenous bacterial suspension is negative, no help is derived from vaccines. There are two other combinations that I should like to mention, because of their practical importance in treatment and because my data represent many years of careful follow-up: 1. In cases in which antral washings yield a positive bacterial growth, culture of tissue is sterile, there is no local eosinophilia of the tissue but an increase in the eosinophil content of the blood and the cutaneous reaction to the autogenous bacterial suspension is positive, vaccines should be employed. 2. In cases in which organisms are isolated from the antral washings, culture of tissue is sterile, there is no eosinophilia of the tissues or of the blood and the cutaneous reaction to the bacterial suspension is negative, vaccine treatment should not be given, as it has no particular value.

I do not want to be misunderstood regarding the question of the allergic basis of thickened membranes or polyps in the sinuses. There is no doubt that many patients with such sinal involvement are allergic

and should not be operated on. I do not refer to those thickened membranes or polyps in the sinuses which cause only local symptoms. I am discussing bronchial asthma believed to be due to a nasal pathologic condition. The bronchospastic type of asthma resulting from remote reflex stimuli originating in the nose or the accessory sinuses obviously will not be benefited except by elimination of the local pathologic con-

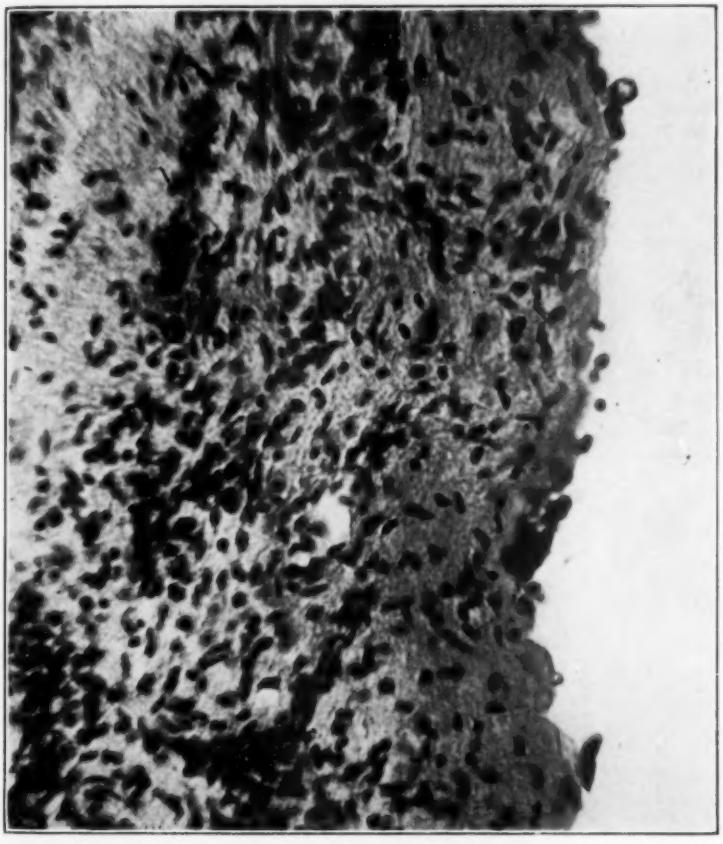

Fig. 3.—Section of tissue removed from the antrum in a case of bronchospastic nonallergic reflex asthma, showing round cell infiltration. No eosinophils are present.

dition. It is my opinion that even in cases of bronchoedematous asthma in which sensitization has taken place a gross nasal pathologic condition must be corrected surgically if lasting satisfactory relief of symptoms is to be expected; this, of course, must be in addition to proper treatment from an allergic standpoint. It is imperative in these cases to establish thorough cooperation between the allergist and the rhinologist.

There is just one more point which I should like to bring out, and that is an observation which I think is extremely important and may explain the cause, at least in some cases, of a persistence of asthmatic symptoms for weeks or even months after the pollen season in cases in which the condition is strictly attributable to pollen. For example, an asthmatic person who is sensitive only to ragweed presents ordinarily a problem just as strictly seasonal as that presented by one who has

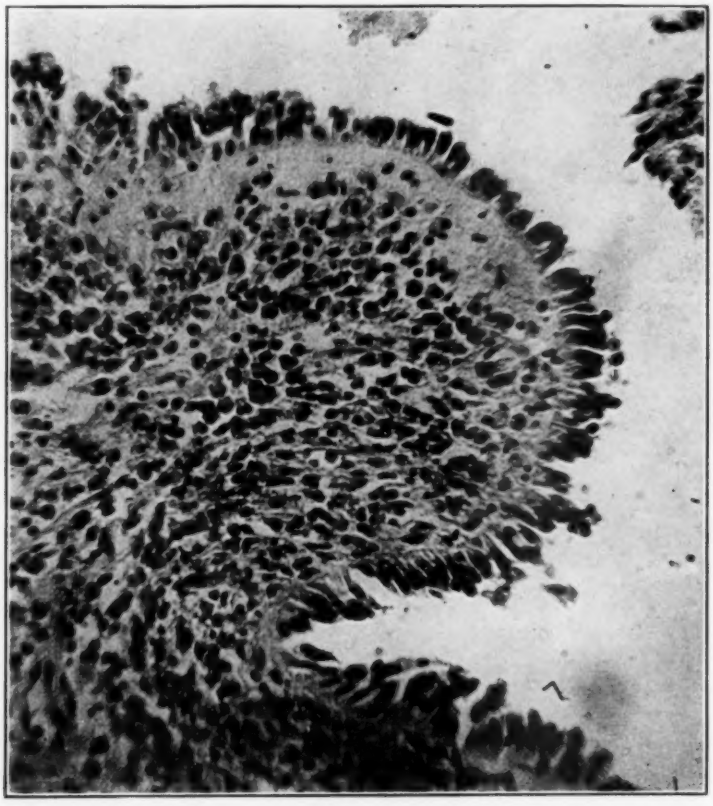

Fig. 4.—Section of tissue removed from the antrum in a case of local and systemic allergy, showing marked increase in eosinophils.

hay fever due to ragweed. However, at times—in fact, rather frequently—one sees symptoms in patients with this type of asthma after all ragweed pollen has disappeared from the air in the particular locality. I believe, and think that I have demonstrated, that the pollen grain becomes embedded in the lining membrane of the antrums and possibly of the other sinuses and is in this way responsible for the continuance of symptoms in highly sensitive persons. I have obtained specimens of tissue from the antrum by means of a specially designed punch and

by curettage and have made extracts of this tissue in Coca's solution and with 14 per cent alcohol. Positive cutaneous reactions have been obtained with these extracts in ragweed-sensitive subjects and no reaction in patients that do not react to ragweed. Passive transfer studies in which the tissue extract was used as the testing allergen to demonstrate the presence of ragweed reagins passively transferred have further corroborated these observations. Twenty cases have been carefully studied from this angle, and in 4 the findings were positive.

In closing, I should like just one word about the importance of endocrine glands and of vitamins in bronchial asthma; these are phases of the subject which one hesitates to discuss because of the present lack of knowledge. I believe that there is a definite relation of endocrine dysfunction and vitamin deficiency not only to asthma but to allergy in general. I do not think that any one gland or a deficiency in any one vitamin is solely responsible. Any gland or combination of glands may be an important factor affecting the underlying fundamental mechanism of hypersensitiveness. I believe that this phase of allergy indirectly may involve a strong hereditary influence and determine the shock tissue.

If I have accomplished nothing more, I hope that I have at least succeeded in further stimulating interest in this fascinating subject.

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CHOLESTEATOMA VERUM OF THE RIGHT MASTOID

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AND
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Cholesteatoma verum within the cranial cavity is rare, and this disease in the mastoid, that is, cholesteatoma without a history or a sign of aural infection, is even rarer.

REPORT OF A CASE

J. K., a white man aged 25, an American, was referred to one of us (M. D. F.) by Dr. M. A. Weitz for neurologic examination on April 23, 1937. The story was as follows: About two months previously a friend of the patient had called his attention to the fact that his face "seemed crooked." The patient then noted that he could not move the right side of his face. He was advised that the condition was Bell's palsy and that it would clear up in time. However, as the weeks went by he could see no improvement in the facial movement, and he therefore consulted Dr. Weitz. The history further revealed that in February 1936 he had noted that the right side of his face "twitched spasmodically at times." He could feel twitchings in his cheek and chin, which recurred at short intervals. These twitchings continued for about two weeks and then cleared up entirely. Six months later he noted the twitchings again, but for only a half a day. Once more they cleared up.

He was then perfectly well until February 1937. He had no headache, no nausea, no vomiting, no olfactory disturbance and no trouble with swallowing. The general physical examination gave negative results. The neurologic examination revealed the following positive findings: Facial paralysis of the peripheral type was present on the right side. There was definite impairment of hearing on the right side, but a 256 double vibration tuning fork could be heard by air conduction. Inspection of the aural canals showed marked narrowing of the right external canal near the inner one third on the external wall. The membrana tympani was entirely normal and glistening white. Taste was normal. Because of the impairment in hearing and the narrowing of the right canal we made a diagnosis of facial palsy secondary to an expanding lesion which was encroaching on the external canal. With this in mind, we had a roentgenogram of the skull taken with particular reference to the mastoid region. Plates were taken by Drs. Freedman and Mahrer, and it was their interpretation which led to the preoperative diagnosis of cholesteatoma. Their report was as follows:

"The right mastoid is densely sclerotic and entirely devoid of cellular outlines. The cortex is greatly thickened, and there is diminished density of the antrum close to the sinus, suggesting early cholesteatoma formation. The right pyramid shows a loss of continuity of the lateral portion of the superior margin but

Fig. 1.—Anterior-posterior view of the skull for comparison of the mastoid regions.

Fig. 2.—The two mastoids.

is otherwise fairly cellular. There is no thickening of the margin, and the calcium content appears to be normal. Impression: sclerosed right mastoid, with possible early cholesteatoma and involvement of the right petrosa."

The laboratory work gave essentially negative results. A spinal puncture done preoperatively revealed an increased pressure (270 mm. of water). Response to compression of the left jugular vein was prompt and adequate, while with compression of the right jugular vein there was a slow rise of only 5 mm. (water manometer). In view of the roentgen findings it was deemed best to approach the lesion through the right mastoid. On April 26 the patient was operated on by Dr. Quittner. As soon as the cortex of the right mastoid was removed (it was thin but very hard) a glistening white membrane was visible.

As the facial wall was approached one could see where the cholesteatoma had absorbed the bone in the external canal, causing the bulging of the external

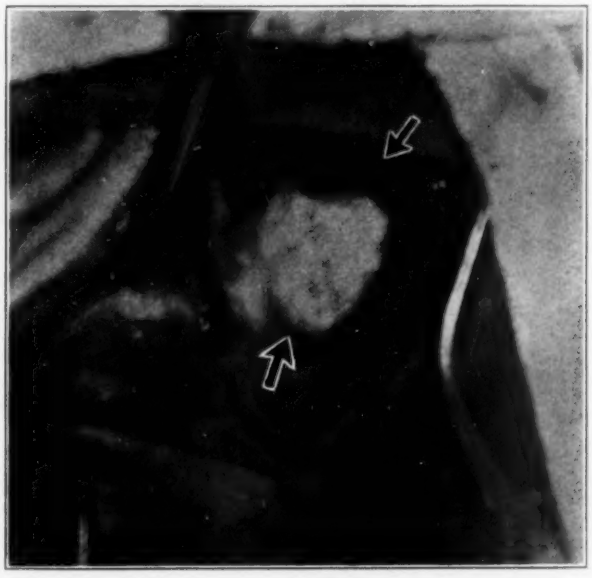

Fig. 3.—The tumor as it appeared at the operation

wall. Figure 3 shows the tumor after all the superficial external bone had been removed. Removal of the cholesteatoma toward the antrum was carried out. As the facial nerve was approached careful removal disclosed the nerve free in débris to the extent of about 1.5 cm. The nerve was brownish. The external semicircular canal was intact. The débris did not involve the middle ear, and therefore the aditus was not touched. Where possible the glistening capsule was left intact, as in the upper and the middle parts.

Fearing encroachment on the lateral sinus because of absorption (as shown by the compression test), Dr. Quittner attempted careful removal in this area. With the barest removal of débris, however, a gush of venous hemorrhage took place. Pressure was placed at this point, and attempt was made to clean out the débris above. Another venous gush occurred. No further attempt was made, and with a pressure pack on the sinus the cavity was temporarily closed until thrombosis took place.

No general reaction to the operation occurred except a slight rise of temperature for two days. Five days later removal of the pack showed that thrombosis was present, and the cavity was reopened. The remainder of the débris over the sinus was removed. The facial wall was lowered, but as the aditus and the membrana tympani were normal, no work was done in this area. A Korner plastic flap was turned into the cavity, with a large portion left below to roll over the exposed part of the facial nerve.

The patient was discharged from the hospital on May 9.

At the time of writing the ear is dry, the glistening wall of the capsule is clearly seen in the mastoid cavity and the membrana tympani appears normal. Hearing for the conversational voice close to the ear is excellent. The facial nerve has shown progressive recovery, so that the patient is able to move all his facial muscles to some extent, and the range is increasing regularly.

SUMMARY

Primary cholesteatoma of the mastoid is rare. Pathologically, the tumor in our case was diagnosed as an epidermoid cyst. It produced peripheral facial paralysis, which had been diagnosed as Bell's palsy. Surgical removal of the tumor cured the facial paralysis.

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PSYCHIATRIC THERAPY FOR DYSPHONIA

APHONIA; PSYCHOPHONASTHENIA; FALSETTO

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The so-called functional disorders of the voice are presumably of psychic origin, with no organic involvement. However, it has slowly been realized that biologically one can never classify a disorder as purely functional or purely organic. It is always a question of considering the organism as a whole, that is, considering all the phases of the person's makeup—mental, physical and emotional.

While it is important to know how mature a person is physically and mentally, it is equally—if not more important—to know how mature he is emotionally. This is particularly true when one considers that an innate tendency toward emotional and nervous instability underlies the neuroses and that, to a greater or lesser degree, the dormant seeds of a neurosis are present in all human beings. That is, all persons are liable to peculiar states of tension or irritability of the nervous system.

These states, which underlie the neuroses, are generally not regarded as organic, but are considered as behavior states. The general idea that these conditions have a nonphysical basis is predicated on the absence of any evident lesions. Observations, however, definitely point to the facts that some persons show marked evidence of an inherited neuroplastic diathesis and that, regardless of the absence of any evident lesions, the abnormal behavior of a person depends on defects, limitations or faulty action of his anatomic mechanism.

Harrington [1] pointed out the fallacy of regarding behavior states as purely functional, said that "the cause of abnormal behavior is to be found in the unfitness of the organism for its environment" and that "this unfitness of the organism for its environment is due to three factors—defective heredity, defective education, and defective bodily health."

Neuroses, then, should never be considered apart from the organism, but should be regarded as an integral phase of that organism.

Read before the Section of Otolaryngology of the New York Academy of Medicine, April 20, 1938.

1. Harrington, M.: A Biological Approach to the Problem of Abnormal Behavior, Lancaster, Pa., The Science Press Printing Company, 1938, p. 442.

A neurosis as it develops may take on various definite forms, but the commonest of all are the anxiety states, in which the person is continually in a state of fear, expressed both physically and mentally. This fear, which is termed neurotic anxiety, is perceived psychically as an unknown danger threatening the personality.

The persons suffering from the disorders of the voice which I am about to consider all demonstrate neurotic anxiety of one form or another. They are in a constant state of nervous tension, and all fall under one general classification—neurotic persons of the sympathicotonic type. Although their respective clinical pictures vary in the number, character and intensity of the presenting symptoms, certain subjective and objective symptoms are common to all of them.

They are tense, restless, apprehensive and uneasy, and they show a marked lability of the pulse and blood pressure, with unusual tachycardia when under emotional stress. They are generally afflicted with hyperhidrosis and have cold, clammy hands and feet. While the basic metabolic rate is normal or only slightly below normal, they demonstrate a tendency toward marked fatigue.

Further, these patients possess a relatively high potential for the spread of emotional tone (that is, a tendency for dominance of the sympathetic division of the vegetative nervous system) which far overreaches that of the normal person. Anxiety neuroses and phobias of various kinds are common, and nervous instability is usually found to be a familial trait. In the words of Dr. Stanley Cobb,[2] these persons are "born tender and are exquisitely vulnerable to the hurts of the world."

In temperament they are generally absorbed with themselves and self centered (narcissistic). In their contacts with the external world they are rather aloof, subjective and egocentric—all of these traits usually being defense mechanisms against basic anxiety and feelings of inadequacy or inferiority.

Such persons, in order to escape from an intolerable situation, will often convert their unconscious neurotic anxiety into a physical manifestation. Quite frequently this process of conversion is located in the vocal tract, as is seen in the various forms of dysphonia, such as psychophonasthenia, hysterical aphonia and, in many cases, falsetto voice.

PSYCHOPHONASTHENIA

The first form of dysphonia—psychophonasthenia—for years has been erroneously diagnosed as weak voice, phonasthenia. The symptoms of this disorder are variable, but the patient usually complains of a

2. Cobb, S.: Review of Neuropsychiatry for 1937, Arch. Int. Med. **60**:1098 (Dec.) 1937.

tight, constricted throat, uncontrollable choking sensations when speaking and strained voice which lacks carrying power. To the listener his voice presents other marked characteristics. It is strident, rasping, grating—a croaking, pinched voice with irregularities of pitch.

The condition has been variously attributed to a forced technic, as overfatigue in singers and speakers; to local involvements of the organs of speech, and to physical or mental sufferings.

The slight lack of approximation of the vocal cords or irregular contact of the cords, or even a slight congestion which is often noticed, is usually not enough cause for the chronically strained condition of the voice. Laryngologic findings are negative, because the condition is not dependent on local pathologic changes but is due to psychic factors that have their roots in the atypical constitutional makeup of the person and in his atypical psychologic development.

Although the patient always complains of unusual effort and fatigue, there is no causal fatigue laryngologically and no local involvement, but there is a decided causal psychic state. The vocal manifestation is merely a symptom of the person's neurotic anxiety.

States of anxiety in combination with such a patient's tendency toward emotional imbalance cause misdirected laryngeal effort, to which, in the course of time, he becomes conditioned. Since the problem is fundamentally psychic—emotional—this condition has come to be designated at the National Hospital for Speech Disorders as psychophonasthenia.

Paradoxic as it may seem, these patients suffer not from a weak larynx or from functional fatigue of the voice as pointed out by Flatau,[3] Fröschels [4] and others, but from a larynx which in reality is overpowerful.

The patient, never realizing the psychic origin of his condition, erroneously seeks to help himself through laryngeal action. He uses his larynx as an instrument of pressure instead of as an instrument of performance. He inhibits the production of voice through muscular pressure, vocalizing *with* his throat instead of *through* his throat.

The psychophonasthenic patient's method of vocalization diminishes the carrying power of his voice. Exaggerated pressure causes the thyroid cartilage to be drawn up to the hyoid bone, so that the arytenoids are rotated on their facets, being articulated with the cricoid cartilage. Thus the vocal cords are adducted to a tighter contact and in their movements create greater friction, which results in a tense form of phonation instead of a normal resonant voice.

3. Flatau, T. S.: Die funktionelle Stimmschwäche (Phonasthenie) der Sanger, Sprecher und Kommandorufer, Charlottenburg, G. Bürkner, 1906.

4. Fröschels, E.: Lehrbuch der Sprachheilkunde (Logopädie) für Aerzte, Pädagogen, und Studierende, ed. 1, Leipzig, Franz Deuticke, 1925.

All this process is merely a "physiologizing" of the emotions. Because of his constitutional makeup and his atypical psychologic development, the person acquires an unconscious fear or feeling of inadequacy—a fancied or real inability to measure up to a necessary standard in a competitive world—which in the course of time results in a neurosis.

The patient's extreme laryngeal manifestations may be said to be a deficiency specialization—a hysterical mechanism which he uses as a defense. This is borne out by the fact that the condition usually develops during late adolescence or during adulthood and is most often observed in those whose vocations especially call for public contacts—ministers, lawyers, singers and many others.

HYSTERICAL APHONIA

Another type of patient will now be considered, whose cardinal symptom is likewise misleading—the patient who suffers from hysterical aphonia or functional loss of voice. The physical dysfunction, like that of the psychophonasthenic patient, is due to neurotic background and psychic influence; but the onset, course and nature of the two conditions are markedly different.

In hysterical aphonia the onset of the disorder is relatively sudden and acute rather than gradual and cumulative. Since the patient almost invariably loses his voice after a "cold," the organic plausibility of the symptom is extraordinarily thorough. On examination, however, the laryngologic findings, with certain minor exceptions, are almost invariably negative.

A complete anamnesis will usually reveal that the condition of the voice is just a vocal projection which masks the patient's underlying difficulty—it is a neurotic escape from an environment which is distasteful or which threatens his security or happiness.

A brief résumé of a few cases will illustrate the nature of this disorder and the most efficacious type of therapeutic procedure.

Type One.—J. G., a married woman aged 30, had suffered recurrent loss of voice for the past four years. She had had many forms of treatment, including tonsillectomy, treatments of the throat and the sinuses and a series of injections, with no permanent results. Roentgenograms also were taken to allay suspicion of tuberculosis.

The patient came under observation at the clinic six months ago. The anamnesis revealed that she unconsciously resented the affection her husband bestowed on their children. It was a blow to her narcissism. Her unconscious solution was to gain his attention by the "physiologizing" of her emotions through a conversion mechanism.

The patient was persuaded, through psychiatric counsel and suggestion, to accept the true meaning of her symptom and has talked normally ever since. However, I understand that her conversion has now taken on a new form. She

believes she is pregnant and displays positive symptoms, despite her obstetrician's assurances to the contrary. Apparently, she has merely substituted one symptom constellation for another. Technically, however, the case can be closed with the terse statement, "patient cured of aphonia." She is definitely out of the realm of the laryngologist. He has been superseded by the obstetrician.

Type Two.—M. H., a single woman aged 22, for six months was not able to speak above a whisper. She consulted a number of doctors, had her throat scraped and painted and underwent massage, tonsillectomy and manipulations—all to no avail.

The patient was surprisingly complacent about the condition of her voice. Examination revealed that she suffered from severe myopia and was so extremely sensitive about it that she unconsciously resorted to social withdrawal or flight, for which her loss of voice supplied the legitimizing sanction. She had no interest in treatment which threatened to remove her distraction and prevent her flight from a painful reality.

The painful reality was going to work. Since the work in question would call attention to her myopia, she unconsciously incapacitated herself by losing her voice. Her stage whisper legitimized her escape and at the same time was distinct enough to serve all other practical purposes.

Local manipulations had only entrenched the aphonia, because it is generally futile to remove the unconscious crutch of a neurotic patient in flight by means of direct attack. The therapeutic procedures adopted at the clinic to date have also been ineffective, and it is obvious that the patient requires further psychiatric attention.

Type Three.—M. G., a married woman from Canada aged 49, had suffered recurrent loss of voice for the past two years.

The patient, an active business woman in her husband's department store, suddenly lost her voice on her return from a trip abroad. She took the usual numerous treatments, both in Canada and in New York, with the added feature of having several teeth extracted. She was also sent on a cruise as a therapeutic measure, but to no avail.

While away from home, seven months after losing her voice, she suddenly began to talk normally. Ten months after this recovery, on returning home from another trip, she again lost her voice. Her aphonia persisting, she came to New York for treatment, at which time she was referred to the clinic.

Analysis revealed that although the patient participated actively in her husband's business and protested that she enjoyed the work, she unconsciously rebelled against being tied down to the store and also against her husband's transference of attention to it. Her aphonia, which was precipitated on both occasions by a return to her old routine, was at once her means of escape and a means of gaining attention.

A simple explanation of the basis of her condition, which the patient readily accepted, followed by local measures in the nature of placebo, brought about desired results.

FALSETTO VOICE

Still another symptom complex is paraphonia, or falsetto voice. The voice of a man afflicted with this condition is thin, high, shrill and piping. It sounds forced or unnatural and, as its name implies, is a false voice—a child's voice produced by an adult.

An undeserved popular stigma is attached to the person with a falsetto voice, because this type of voice is characteristic of the eunuch and the eunuchoid (fig. 1). This misunderstanding is unfortunate for the person possessing a falsetto voice, since in almost all cases the stigma of doubtful sexuality is entirely unfounded (fig. 2).

The following excerpts from case histories convey clearly the marked social implications which falsetto voice has for the sufferer:

B. H., aged 28: "I have had trouble with my voice being high (like a woman's) since I was 15 or 16 years old. . . . A throat specialist told me there was nothing physically wrong with me. I have always been nervous and seem to be

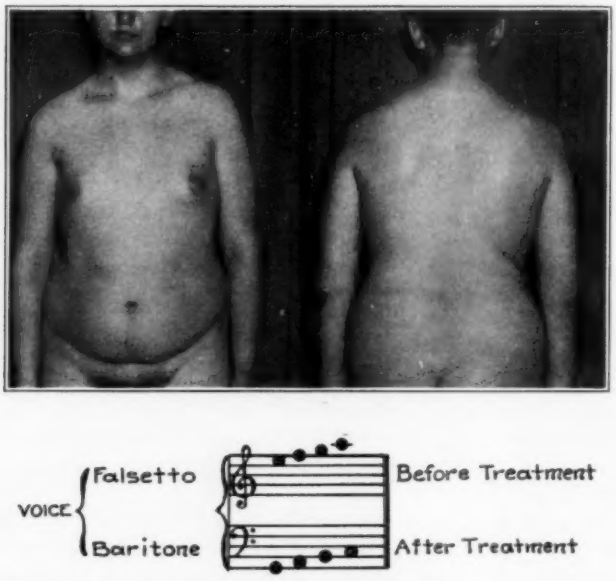

Fig. 1.—Boy aged 17, of eunuchoid type, with polyglandular fat anomalies and female characteristics. Range of voice before and after treatment.

more so since my voice changed. People always tease me about my voice. . . . I am very self conscious and avoid other people as much as possible."

A. R., aged 45: "Ever since I have grown up I have felt embarrassed when in a group of men. Whenever I speak, they all laugh. . . . I suffered untold agony when I was in the army. The other soldiers laughed at me and would make remarks in a loud whisper as I passed. . . . I have become so sensitive about my voice that I will not even read aloud to my little daughter. Sometimes I feel I am going crazy, and I believe I should be happy just to lie down and die."

Like the other disorders, falsetto voice may usually be said to be a purely functional condition, with no pathologic involvements of the vocal organs or of the organs of generation. In its initial state, the condition can be considered as simply a neurotic manifestation of excessive sensitivity at the pubescent period.

A sensitive boy who shows neurotic tendencies and who in general is out of balance during his adolescent years is more than normally embarrassed and shocked by his general systemic changes, the change of voice included. He strives to remain on his childish level and clings to his high-pitched, shrill voice. Through constant use of this high voice, he causes a faulty coordination and misdirection of the phonatory muscles. There is an abnormal tug on the levator muscles, so that the larynx is raised to an abnormally high position in the throat.

The condition if uncorrected continues throughout the person's life, and the psychic traumas sustained by the supersensitive, neurotically inclined adult male have far reaching and serious effects.

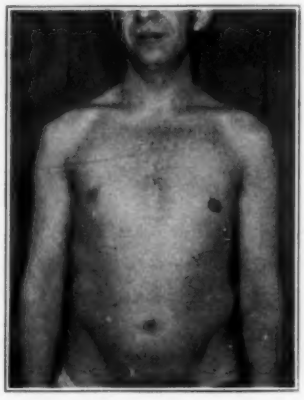

Fig. 2.—Man aged 33 (married, with two children), of dysplastic type (asthenicopyknic). A falsetto voice of twenty years' duration was changed to a normal male speaking voice.

PROGNOSIS

The main determinant of the prognosis in dealing with all these abnormalities is the degree of healthy personality which the patient presents.

In the majority of psychophonasthenic patients, the vocal disorder is so deeply ingrained psychically and the maladjustment of the personality so intertwined with environmental conditions which rarely can be changed that prognosis is none too favorable.

The circumstances which cause the onset of hysterical aphonia are situational, and the vocal manifestations are usually acute. The patients generally fall into three categories, as illustrated by the histories already given.

In type 1 the personality and the emotional reactions are on the infantile level. Aphonia proves an extremely useful mechanism, and recurrences take place as new emotional crises arise. Comprehension of the true nature of the disorder results in a cure or in conversion.

Patients of the second type unconsciously resist therapy. The disorder proves a valuable asset, and the symptom is relinquished only when it suits the patient's purpose.

The third type is represented by the person who can readily be brought to a full understanding of the unconscious motives underlying the disorder. The therapeutist usually can gain his confidence and cooperation, so that either the precipitating environment or the outlook on the environment is changed, making prognosis favorable.

The person with falsetto voice up to the age of puberty is a so-called normal person. His neuroticism, which develops later and which in many instances is severe, can usually be resolved when the condition of the voice is corrected. Consequently, the prognosis is favorable.

TREATMENT

While treating these patients the therapeutist must realize that the person's abnormal psychologic reactions are based on a physiologic foundation, that his thoughts, feelings and actions are governed by the defects and limitations of his anatomic mechanism, that although his condition shows no evidence of organic lesion, still there exists a form of physical inferiority which influences the organism as a whole.

Therefore, a composite therapy which considers all these factors, including the development of a more integrated and mature personality, must be instituted in order to obtain desired results.

In a case of psychophonasthenia, for example, the laryngologist alone cannot administer adequate therapy. Since the basis of this disorder is on a deep level, psychiatric collaboration is most advisable. At the same time, a course of special training should be introduced to counteract vocal anomalies brought about through misuse of the larynx.

In the case of the patient with a falsetto voice, the laryngologist must have both psychiatric and musical leanings in order to bring about complete reorganization.

The same therapeutic idea applies to hysterical aphonia. Instead of using shock, which occasionally proves useful but more often detrimental, it is far better to employ a psychiatric approach in order to obtain more lasting results and thus avoid possible disaster.

In conclusion, let me emphasize the fact that it is necessary to use both local and general therapy. The presenting physical symptom—defense mechanism—must be considered as secondary and not as the principal object of treatment.

A careful anamnesis will generally uncover the underlying factors of these physical symptoms. Psychiatric measures should be directed toward bringing the patient's unconscious motives into consciousness. When this is accomplished, fundamental changes in the personality occur. The patient then accepts himself as he is, making the most of his physiologic foundation.

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INFLUENCE OF SULFANILAMIDE ON INFECTED SINUSES OF RABBITS

CHEMICAL AND MICROSCOPIC STUDIES

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According to the numerous reports which have appeared in the literature during the past year, sulfanilamide (paraaminobenzenesulfonamide) therapy has continued to hold a prominent place in the successful treatment of pneumococcic,[1] meningococcic [2] and gonococcic [3] infections and others, of a much more remote cause, as well as those caused by hemolytic streptococci.[4] The fact that the immediate toxic effects have been relatively few has been an added impetus to the more extensive administration of sulfanilamide. Some toxic reactions have been easily compensated for by the withdrawal of the drug, while others, of a more serious nature, such as acute hemolytic anemia [5] and agranulocytosis,[6] are probably attributable to idiosyncrasies, according to Marshall and his co-workers.[7]

Many theories have been advanced to explain the mode of action of the drug. Domagk,[8] as the result of experiments in the treatment of experimental streptococcic infections in mice, reported that the phago-

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From the Department of Otolaryngology, Oscar Johnson Institute, Washington University School of Medicine.

Read at the Sixtieth Annual Congress of the American Laryngological Association, Atlantic City, N. J., May 3, 1938.

1. Long, P. H., and Bliss, E. A.: South. M. J. **30**:479 (May) 1937.

2. Branham, S. E., and Rosenthal, S. M.: Pub. Health Rep. **52**:685 (May 28) 1937.

3. Helmholz, H. F., and Osterberg, A. E.: Proc. Staff Meet., Mayo Clin. **12**:377 (June 16) 1937. Dees, J. E., and Colston, J. A. C.: Use of Sulfanilamide in Gonococcic Infections: Preliminary Report, J. A. M. A. **108**:1855 (May 29) 1937.

4. Basman, J., and Perley, A. M.: J. Pediat. **11**:212 (Aug.) 1937.

5. Harvey, A. M., and Janeway, C. A.: Development of Acute Hemolytic Anemia During the Administration of Sulfanilamide (Para-Aminobenzenesulfonamide), J. A. M. A. **109**:12 (July 3) 1937.

6. Berg, S., and Holzman, M.: Fatal Granulocytopenia Following Sulfanilamide Therapy, J. A. M. A. **110**:370 (Jan. 29) 1938. Borst, J.: Lancet **1**:1519 (June 26) 1937.

7. Marshall, E. K., Jr.; Cutting, W. C., and Emerson, K., Jr.: The Toxicity of Sulfanilamide, J. A. M. A. **110**:252 (Jan. 22) 1938.

8. Domagk, G.: Deutsche med. Wchnschr. **61**:250 (Feb. 15) 1935.

cytosis of the streptococci by the leukocytes was the important factor in removing the organisms from the tissues. Levaditi and Vaisman [9] stated that sulfanilamide interfered with the formation of capsules and thus rendered the streptococci more susceptible to phagocytosis. Colebrook and his co-workers [10] asserted that the serums of patients treated with certain of the derivatives of sulfanilamide were capable of inhibiting the growth of the hemolytic streptococcus in vitro and that the blood and serum of such patients also exerted a bactericidal as well as bacteriostatic action on the hemolytic streptococcus.

On the other hand, Gross, Cooper and Peebles [11] stated the belief that the phagocytic activity of the polymorphonuclear leukocytes and the monocytes is not important in controlling experimental streptococcic infections in mice. Bliss and Long [12] stated that the effect of sulfanilamide in experimental streptococcic infections in mice led them to believe that its action is primarily one of slowing down the rate of multiplication of the streptococci, thus permitting them to be phagocytosed by the white blood cells. They have likewise demonstrated that the leukocytes are essential if recovery from the streptococcic infection is to be expected. Osgood and Brownlee [13] after a series of experiments in the culturing of human marrow concluded that the major action of sulfanilamide on the beta hemolytic streptococci seems to be a neutralization of the toxins. By decreasing the rate of division of cells, while not killing the organism, sulfanilamide thus favors the more extensive phagocytic actions of the leukocytes, though it has no direct effect on phagocytosis.

It is thus obvious from these and other excellent contributions, too numerous to mention, that the trend of thought of most investigators relative to the action of sulfanilamide is inclined along similar channels. Nevertheless, the empiric status of the drug has not been changed. Marshall, Emerson and Cutting [14] have found that after its administration to dogs it was recovered from practically all the organs and tissues of the body. The amounts varied from 3.0 mg. per hundred cubic centimeters in fat to 20.7 mg. in liver, and the range of values in the

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9. Levaditi, C., and Vaisman, S.: Compt. rend. Soc. de biol. **121**:803, 1936.

10. Colebrook, L.; Buttle, G. A. H., and O'Meara, R. A. Q.: Lancet **2**:1323 (Dec. 5) 1936.

11. Gross, P.; Cooper, F. B., and Peebles, M. L.: Proc. Soc. Exper. Biol. & Med. **36**:311 (April) 1937.

12. Bliss, E. A., and Long, P. H.: Observations on the Mode of Action of Sulfanilamide, J. A. M. A. **109**:1524 (Nov. 6) 1937.

13. Osgood, E. E., and Brownlee, I. E.: Culture of Human Marrow: Studies on the Mode of Action of Sulfanilamide, J. A. M. A. **110**:349 (Jan. 29) 1938.

14. Marshall, E. K., Jr.; Emerson, K., Jr., and Cutting, W. C.: J. Pharmacol. & Exper. Therap. **61**:196 (Oct.) 1937.

blood was 10.2 mg. to 19.8 mg. No mention was made of its occurrence in the tissues of the nose or the sinuses.

PURPOSE

The purpose in undertaking the following experiments was, first, to ascertain whether or not sulfanilamide was deposited in the tissues of the noses and sinuses of rabbits in sufficiently large amounts theoretically to affect a streptococcic infection in these tissues; second, to study its effect on some tissues in which infection was not present and on some in which infection had been induced by the instillation of a virulent culture of the hemolytic streptococcus into the paranasal sinuses.

METHOD

Healthy rabbits, weighing between 3 and 4 pounds (1.3 to 1.8 Kg.), were selected and observed for seven to ten days for freedom from infection.

Administration of Sulfanilamide.—Sulfanilamide was administered to each rabbit on the basis of 1.5 Gm. per kilogram (10 grains per pound) [15] for each twenty-four hours, the entire dose being given at the same time each day.

For the rabbits of group I the tablets were placed individually in the hypopharynx and crushed, after which several dropperfuls of water were introduced into the rabbit's mouth. To the rabbits of group II a suspension of sulfanilamide tablets ground in a mortar with 10 cc. of warm water was administered through a stomach tube, followed by 5 to 10 cc. of warm water to clear the tube.

Inoculation.—All of the rabbits of group II were infected with a twenty-four hour broth culture of a virulent strain of hemolytic streptococcus, obtained from the heart blood of patients who had died of septicemia caused by infection with the hemolytic streptococcus. One-half cubic centimeter of the culture was injected through the lateral membranous window directly into the sinuses on the right side, and four to nine days were allowed to elapse in order to be certain that infection was well established in these sinuses before the administration of sulfanilamide (tables 2, 3 and 4). On the day on which the administrations of sulfanilamide were begun, 1 rabbit out of each group of 6 was killed as a control to determine the extent to which the infection of the sinus had progressed.

The daily administration of sulfanilamide was instituted for a period of one to four days in the case of 4 rabbits. At the end of this time, the 4 rabbits were killed, as was also 1 animal which had originally been infected but had not received sulfanilamide, in order to obtain an idea of the uninterrupted progress of the infection in the sinuses over the entire period of the respective series. Immediately before the rabbits which had been given sulfanilamide were killed, 10 cc. of heart blood was taken, and quantitative studies were made, the modified technic of Marshall, Emerson and Cutting being followed.[16]

All rabbits were killed by injecting air into the heart. The nose was severed immediately anterior to the orbits and divided in midline along the septum.

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15. Raiziss, G. W.; Severac, M., and Moersch, J. C.: J. Chemotherapy **14**:1 (April) 1937.

16. Marshall, E. K., Jr.; Emerson, K., Jr., and Cutting, W. C.: Proc. Soc. Exper. Biol. & Med. **36**:422 (April) 1937.

The right (the infected) side was placed in solution of formaldehyde, diluted 1:10, for twenty-four hours, decalcified, sectioned and stained with hematoxylin and eosin. The turbinates and walls of the sinus of the left side of the nose, the uninfected side, were thoroughly exenterated and weighed; this tissue was then placed in 10 cc. of alcohol in a mortar and ground with a small amount of sand until thoroughly disintegrated, after which the solution was placed in a large centrifuge tube and quantitative studies made according to the technic of Marshall, Emerson and Cutting [14] as follows:

"After standing overnight the alcoholic tissue suspension was centrifuged, the alcohol poured off, and the tissue residue extracted four times with alcohol. The final volume of the alcoholic extract of the tissue was adjusted so that a total of 20 cc. of alcohol was used for each gram of tissue. Sulfanilamide was determined in the alcoholic extract by the following modification of our original alcohol method for blood. Ten cubic centimeters of the alcoholic extract were measured into a small flask; 5 cc. water, 2 cc. of 0.3 N hydrochloric acid, and 1 cc. of 0.1 per cent sodium nitrite were successively added. After three minutes, 1.5 cc. of the alcoholic solution of dimethyl-α-naphthylamine (1 to 100 cc. alcohol) were added. After five minutes, the solution was filtered, and the filtrate compared in a colorimeter with a standard solution of sulfanilamide in alcohol, which had been treated in the same way as the alcoholic extract."

TABLE 1.— *Group I: Sulfanilamide Controls*

Rabbit	Administration of Sulfanilamide		Elapsed Time, Days	Last Dose Before Death	Sulfanilamide Determinations*	
	Dose, Grains	Total, Grains			Blood, Mg. per 100 Cc.	Tissue, Mg. per 100 Cc.
1	35	205	19	5 days; died	0.8-19.0	0
2	15	75	6	24 hr.; killed	3.7-13.7	27.0
3	20	110	8	48 hr.; died	2.4	8.0
4	35	130	8	24 hr.; died	Negative	6.0
5	35	170	15	5 hr.; killed	0.5, 36.0, 42.0	27.0
6	35	165	15	5 hr.; killed	1.6, 6.0, 49.0	29.0

* The determinations of sulfanilamide were done by Miss Jane Erganian of the Washington University School of Medicine, through the courtesy of the department of medicine.

RESULTS

The purpose of the control studies was twofold: to determine the length of time which could be permitted to elapse between doses before the blood would be found to be free of sulfanilamide and to ascertain before proceeding with the administration of sulfanilamide to the infected group whether or not there were any cytologic changes in the mucosa of the nose and paranasal sinuses caused by sulfanilamide alone in healthy uninfected rabbits. The sulfanilamide was given by mouth to the rabbits of group I in order to simulate the manner of administration in human beings, since it is known from the reports of Marshall and his co-workers [17] that absorption from the intestinal tract takes

17. Marshall, E. K., Jr.; Emerson, K., Jr., and Cutting, W. C.: Para-Aminobenzenesulfonamide: Absorption and Excretion; Method of Determination in Urine and Blood, J. A. M. A. **108**:953 (March 20) 1937.

place rapidly and completely. Of the 6 rabbits, 3 died; consequently the immediate antemortem determinations on the blood could not be done. The cause of death was not determined, unless it could be attributed to the repeated cardiac punctures and exsanguination, as 10 cc. of blood was aspirated every few days for determinations of sulfanilamide. It was not felt that the deaths were caused by the sulfanilamide, as there were no symptoms of toxicity in these rabbits or in any in this group.

The wide variations in the amount of sulfanilamide found in the blood, as shown in table 1, were the result of two factors, the diminution of the daily dose too far below the dose prorated by weight and the permitting of more than twenty-four hours to elapse between doses. This variation in amount occurred irrespective of the total amount administered over the entire period. This is consistent with the findings of Marshall and others,[17] viz., that the drug is rapidly eliminated and

TABLE 2.—*Group II, Series 1*

	Inoculations with Hemolytic Streptococci		Administration of Sulfanilamide				Sulfanilamide Determinations		
Rabbit	No.	Days	Days	Dose, Grains	Total, Grains	Day Killed	Blood, Mg. per 100 Cc.	Tissue, Mg. per 100 Cc.	Toxic Signs
8	2	12	4	40	160	14th	38	23	Yes
11	2	12	4	40	160	14th	47	31	Yes
12	2	7	4	40	160	14th	27	9	No
13	3	4	2	40	80	6th	19	17	No
14*	3	2	Average				30		
15†	2	7	Average					17	

* Rabbit 14 was killed early in the experiment as a control.
† Rabbit 15 was killed at the end of the experiment as a control.

that sustained dosage must be adhered to in order to maintain an optimum concentration in the blood of 11 to 16 mg. per hundred cubic centimeters in human beings. A similar variation was found in the sulfanilamide content of the nasal tissue, the amount being found to be more or less according to the time elapsed since the last dose before death.

In the case of the rabbits of group II, the number of inoculations, the amount of the dose and the elapsed time were arbitrary. The desideratum was a well established infection of the sinuses on the right side. This was considered to be present when there occurred and persisted a definite swelling over the window of the sinus, with or without the presence of secretion in the right nostril. In several of the rabbits the sinuses were aspirated and the original organism recovered in pure culture. Because of the variation in the sulfanilamide content of the blood in group I, it was decided that the administration of a suspension of sulfanilamide with a stomach tube would be the more accurate

method. A no. 16 catheter was therefore passed, without difficulty, into the stomach and a 10 cc. syringe used to instil the proper dose, prepared as has been indicated.

Since it had been found in the control group that daily dosage was necessary in order to maintain the sulfanilamide content of the blood and tissue above a certain level, the desired dose was administered to each of the rabbits of group II daily for from one to four successive days. Clinical experience had suggested that the optimum initial clinical response is obtained within ninety-six hours and consequently the cytologic response should be expected within the same length of time. It was intended not to attempt to eradicate the infection entirely, since sufficient time was not allowed, but to determine the cytologic response to the presence of the sulfanilamide in the tissues while infection was still active.

TABLE 3.—*Group II, Series 2*

Rabbit	Inoculations with Hemolytic Streptococci		Administration of Sulfanilamide			Day Killed	Sulfanilamide Determinations		Toxic Signs
	No.	Days	Days	Dose, Grains	Total, Grains		Blood, Mg. per 100 Cc.	Tissue, Mg. per 100 Cc.	
16	3	9	4	40-35 30-20	125	14th	31	17	Yes
18	3	9	1	35	35	13th	32	17	Yes
19	3	9	4	40-35 30-20	125	14th	17	14	Yes
21	3	9	4	40-35 30-20	125	14th	17	Died	No
20*	2	6	Average				24		
17†	3	9	Average					16	

* Rabbit 20 was killed early in the experiment as a control.
† Rabbit 17 was killed at the end of the experiment as a control.

The dose of sulfanilamide was reduced 5 grains (0.32 Gm.) a day for rabbits 16, 19 and 21, series 2, because of the toxic reactions, but maintained for series 3, despite the toxic reactions. In this group, as in group I, the total dose did not directly influence the sulfanilamide content of the blood or tissue. This is evident in the case of rabbit 18, series 2, which had received the smallest dose but showed the highest concentration of the drug in the blood and tissue that was seen in the series. Evidently a maximum initial dose supplies a comparatively large amount of sulfanilamide to the blood and tissues within twenty-four hours in certain animals. The concentration of sulfanilamide in both blood and tissue showed a wide variation, from the lowest in the blood of 17 mg. per hundred cubic centimeters to the highest of 76 mg., and from the lowest in the tissue of 9 mg. to the highest of 47 mg. The sulfanilamide content of the tissue ranged from 11 per cent to 67 per cent lower than that of the blood. This difference is probably explain-

able on the basis of individual susceptibilities or of a disproportion between the rate of absorption and the rate of excretion of the sulfanilamide.

MICROSCOPIC OBSERVATIONS

Group I: Sulfanilamide Treated Control Rabbits.—The epithelium and the subepithelial tissue appeared normal. The glands showed no pathognomonic changes other than a slight distention due to hyperactivity. There was no exudate in the sinuses or the nose.

Group II: Infected Control Rabbits.—The control animals killed early in the experiment showed the usual picture of an acute hemorrhagic exudate in the sinal cavity. This exudate consisted principally of red blood cells, among which were interspersed monocytes in moderately large numbers, polymorphonuclear leukocytes in small numbers in some slides and in larger numbers in others and sloughed epithelial cells. The monocytes and the epithelial cells, especially the former,

TABLE 4.—*Group II, Series 3*

Rabbit	Inoculations with Hemolytic Streptococci		Administration of Sulfanilamide			Day Killed	Sulfanilamide Determinations		Toxic Signs
	No.	Days	Days	Dose, Grains	Total, Grains		Blood, Mg. per 100 Cc.	Tissue, Mg. per 100 Cc.	
24	3	9	4	45	180	14th	32	18	Yes
25	3	9	4	40	160	14th	76	47	Yes
26	3	9	4	40	160	14th	74	44	Yes
27	3	9	4	40	160	14th	22	13	Yes
22*	3	9	Average				51		
23†	3	9	Average					30	

* Rabbit 22 was killed early in the experiment as a control.
† Rabbit 23 was killed at the end of the experiment as a control.

appeared to be more actively phagocytic than the polymorphonuclear leukocytes. The control animals killed at the end of the experiment as a rule showed a marked predominance of monocytes, epithelial cells, many histiocytes containing smaller monocytes and lymphocytes but few polymorphonuclear leukocytes. Large numbers of streptococci were seen in the large monocytes only and not in the polymorphonuclear leukocytes.

Epithelium: The epithelium varied in thickness according to the reaction, the cells being either regular in outline but engorged, with the cilia apparently intact, or greatly thickened by vacuolation, edema or protoplasmic disintegration. In other areas it showed various degrees of fragmentation, from the extrusion of individual cells into the sinus cavity to patchy or generalized sloughing of large areas, leaving in some instances an intact layer of basal cells and in others the unprotected subepithelial tissue. In the control animals killed at the end of the experiment a progression or exaggeration of the early con-

dition was seen, the intact epithelium being thickened by a reduplication of the epithelial cells, by monocytic infiltration or by extreme edema.

Subepithelial Tissue: The most marked reaction was at the site of injection of the infective material into the sinus, extending from the immediate subepithelial tissue into the deeper tissue and consisting in some instances of edema and a moderate infiltration and in others of a marked invasion of plasma cells, monocytes, epithelioid cells, young connective tissue cells and small numbers of polymorphonuclear leukocytes. In the glandular areas the infiltration consisted chiefly of monocytes and plasma cells. The glands were uniformly greatly distended

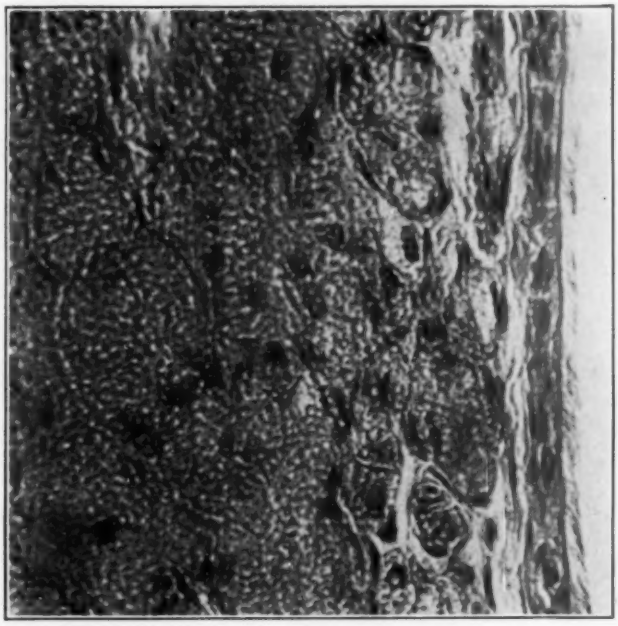

Fig. 1.—Typical picture found in normal and in sulfanilamide-treated control rabbits (group 1). The sinus mucosa contains low columnar ciliated epithelium. There is no cellular infiltration or disintegration of the glands of the subepithelial tissue. (High power.)

throughout and in places disintegrating. In the control animals killed later the same picture persisted, except that young and older connective tissue cells were more numerous and some lymphocytes were present. The polymorphonuclear leukocytes were practically absent.

Group II: Infected Rabbits Treated with Sulfanilamide.—The reactions in the tissue of the infected rabbits which had been given sulfanilamide were similar to those observed in the control rabbits. The behavior of the epithelium was practically identical, and the same types

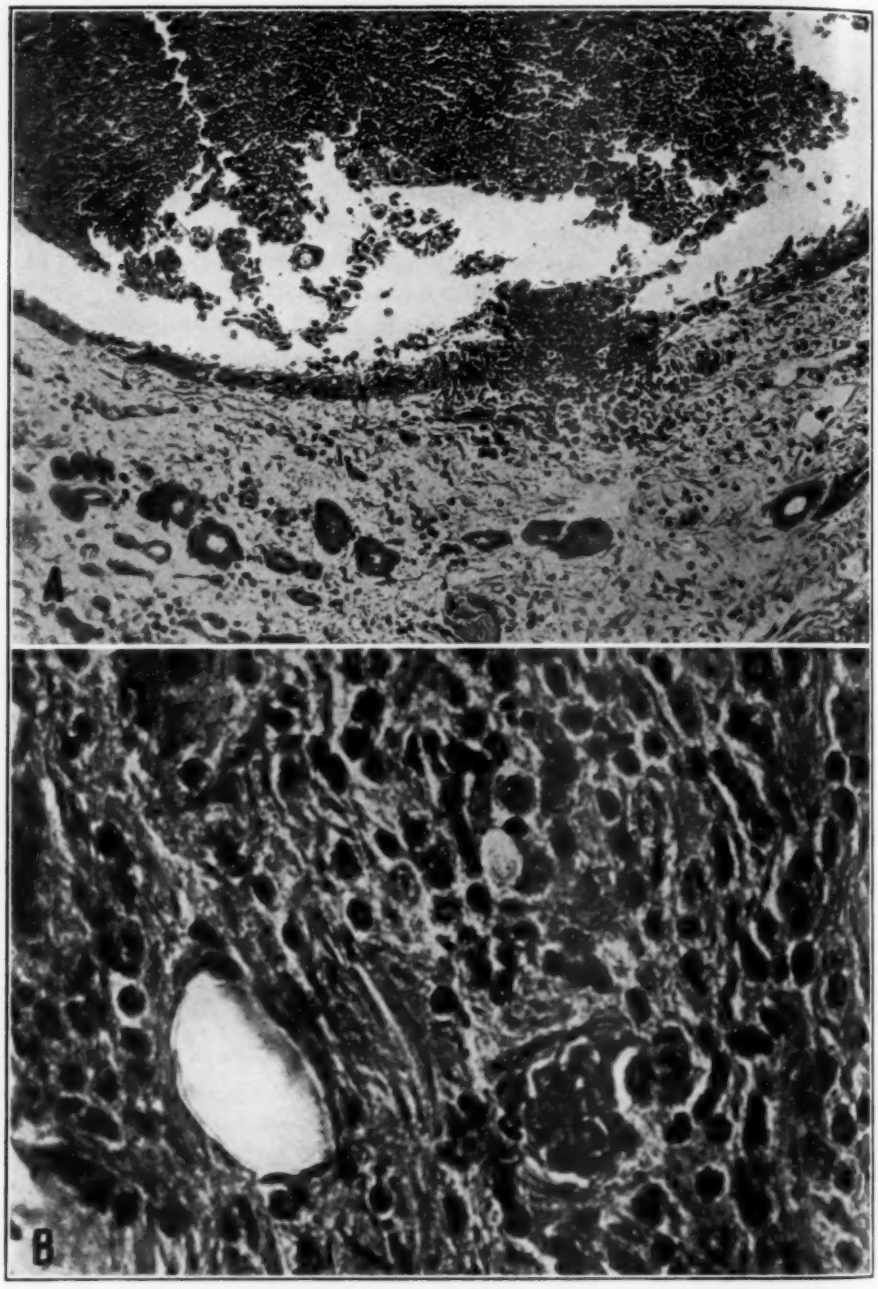

Fig. 2.—*A*, typical picture found in rabbits of group II. The sinus mucosa is markedly edematous and infiltrated with monocytes and plasma cells and a few polymorphonuclear leukocytes; some glands are disintegrating. The sinus cavity contains an exudate composed of red blood cells, monocytes, polymorphonuclear leukocytes and sloughed cells of the ruptured epithelium of the sinus wall, in which the exudate may be seen. (Low power.) *B*, typical cytologic reaction found in all rabbits of group II. The sinus mucosa contains subepithelial tissue heavily infiltrated with monocytes, plasma cells, epithelioid cells and a few polymorphonuclear leukocytes. (High power.)

and relative numbers of cells were present in the subepithelial tissue, except that there were larger numbers of free glandular cells (from ruptured glands) and of polymorphonuclear leukocytes.

TOXIC REACTIONS

Toxic reactions were general, occurring in 9, or 75 per cent, of the 12 rabbits of group II. The following symptoms were found to be constant as to time of onset, character and duration: rapid, labored respiration; apathy, and early spastic clonus of all legs, with partial or complete paralysis of the hindlegs, in the rabbits of series 3 especially, inability to stand and spraddling of the forelegs. In some there was spasm of the abdominal muscles, with arching of the back. Vertigo also was present, manifested by weaving of the head and body and falling to one side or the other, usually toward the side on which the legs were involved, especially on attempt to overthrow. There was no nystagmus.

The onset of these symptoms occurred in from two to four hours after the administration of the sulfanilamide, and it was about six hours before all symptoms subsided. The subsidence was in the reverse order of the incidence. The amount of sulfanilamide given was undoubtedly a significant factor, since the advanced symptoms occurred on the third or fourth days of administration, though the rapid respiration was frequently present after eighteen hours. Nevertheless, 1 rabbit (no. 18, group II, series 2) had received only 35 grains (2.27 Gm.) and showed toxic signs within two hours, which lasted for six and one-half hours, a circumstance strongly suggesting an idiosyncrasy, since the 3 which did not show toxic signs received three to five times as much sulfanilamide.

None of the rabbits in which toxic signs had been noted died, though 7 were killed in five hours, while the symptoms were still present but moderating. The more severe and prolonged toxic reactions were present in the rabbits showing the largest amount of sulfanilamide in the tissue, from which one may conclude that there was an equivalent amount in the tissues of the central nervous system. This fact may account for the symptoms, which were manifestations of marked irritation and probable degeneration of certain parts of the central nervous system.

SUMMARY

In reviewing the findings that have presented themselves in the course of this study, one is confronted with several aspects of the influence of sulfanilamide on rabbits aside from the preconceived plan of study of the cytologic changes in the tissues of the nose and sinus which result from its administration.

The fact that the absorption, the dissemination and the elimination of sulfanilamide occur with great rapidity is borne out by the variability of the amounts recovered from the blood and the nasal tissues irrespective of the total dosage. This suggests two deductions: that sulfanilamide is not likely to give rise to chronic toxicosis and that its field of usefulness is limited to therapeutic, and does not include prophylactic, administration.

The frequent occurrence and the type of the toxic manifestations presented an interesting phenomenon. These toxic signs, which were more apparent in the rabbits which had been given the sulfanilamide at twenty-four hour intervals, did not fully develop until the third day; the delay indicates that there was sufficient accumulation of the drug in nerve tissue to cause the paralysis. The hyperpnea was probably due to acidosis, as described by Marshall.[7]

It was not possible to estimate the threshold dose which might have caused the toxic signs, since the total amount administered for four days ranged from 35 to 180 grains (2.27 to 11.66 Gm.), with the sulfanilamide content of the blood from 17 to 76 mg. per hundred cubic centimeters and that of the tissue from 14 to 47 mg. This wide variation in the amount of sulfanilamide retained by the blood and tissues, even for a short time, when full doses were given strongly suggests a predilection for the drug in certain animals and probably in certain human beings. This possibility should be borne in mind in prescribing maximum doses.

After six to nineteen days' administration of moderate doses, sulfanilamide did not cause changes in the tissues of any of the uninfected rabbits, the microscopic picture of the tissues of the nose and sinus resembling in every respect that of the tissues of normal rabbits. So in the interpretation of the changes which occurred in the rabbits of group II it was certain that they were caused by infection, alone or in combination with sulfanilamide.

The cytologic reaction in the tissues of the infected control rabbits was pronounced, showing evidence of a complete mobilization of the defensive cells, viz., monocytes, plasma cells, polymorphonuclear leukocytes, young connective tissue cells and epithelioid cells, at the point of ingress of the infection and in the cavities of the sinuses and nose. There was an identical cytologic response in the rabbits which had been given sulfanilamide and in which the tissues contained large amounts of the drug. It was impossible to determine the presence of streptococci in these tissues, either extracellularly or intracellularly; consequently no criteria could be established relative to specific phagocytosis here.

The cells of the exudate in the cavities of the sinuses and nose, however, showed active phagocytosis of the streptococci. There were large

numbers of organisms present in the controls killed early in the experiment, both extracellularly and to some extent within the polymorphonuclear leukocytes, but chiefly in the monocytes. On the other hand, in the controls killed at the end of the experiment there were fewer streptococci, and those were practically entirely within the monocytes. In the rabbits treated with sulfanilamide even smaller numbers of streptococci were found. Whether this circumstance was due to the actual absence of the organisms or to their presence in unrecognizable involution forms is a matter for conjecture, as is the question whether the absence of the organisms was induced by the large amount of sulfanilamide in the tissues.

SUMMARY AND CONCLUSIONS

Sulfanilamide administered to 6 uninfected rabbits and to 12 whose sinuses had been injected with hemolytic streptococci was recovered in substantial amounts from the tissues of the nose and paranasal sinuses and from the blood of practically all rabbits.

The reaction to sulfanilamide in the tissues of the nose and the paranasal sinuses of these rabbits was not cytologic.

The beneficial effects derived from the use of sulfanilamide in such infections must be the result of its influence on the organism itself or on its toxins in permitting more active phagocytosis by the polymorphonuclear leukocytes and monocytes.

Sulfanilamide should be as effective in the treatment of streptococcic sinusitis as in the treatment of streptococcic infection elsewhere in the body.

The signs of sulfanilamide toxicity which occurred were hyperpnea, apathy, vertigo and spastic and flaccid paralysis.

634 North Grand Boulevard.

FULMINATING INFECTION OF THE NOSE DUE TO MONILIA OR ASPERGILLUS

REPORT OF A CASE

C. STEWART NASH, M.D.
ROCHESTER, N. Y.

HISTORY

On Aug. 8, 1937, a woman aged 43 complained of a pain over her left eye. Although she admitted losing 28 pounds (12.7 Kg.) in weight during the previous four or five months, she insisted that up to this time she had had no sickness and that her present trouble, namely a pain over the left eye, was unassociated with any other symptoms.

Four days later the upper left eyelid drooped and became swollen; the left eye protruded, and the vision had gone. The patient was nauseated and vomiting, had excessive thirst, frequent urination and difficult and rapid breathing and for the first time called a physician, who immediately sent her to the hospital.

Within the next forty-eight hours she had a temperature of 103 F.; the eye became proptosed from a massive nonfluctuating intraorbital tumor; the left optic disk was markedly choked and soon became invisible because of an intervening exudate. A stony hardness of the globe developed from increased intraocular pressure, and the left side of the nose became occluded by a scabby adherent mass. The right eye remained normal.

During this same time the patient became apathetic and drowsy. There developed a questionable facial paralysis on the left but a definite and complete hemiplegia on the right. The patient remained acutely ill for two weeks, after which the fever and pain disappeared and she began to improve generally, although the left eye was completely destroyed and the hemiplegia remained.

After thirty-three days of hospitalization she was removed to another part of the state, and I did not see her again until March 2, 1938, or seven months after the onset of her symptoms.

EXAMINATION

Negative Findings.—The abdomen, pelvis, heart and lungs were normal, the opinion on the last organ being confirmed by roentgen examination. The blood pressure remained at about 120 systolic and 70 diastolic. The studies of the blood always gave normal results, never showing any dyscrasia, but the white blood count of 8,200 did not increase with the elevation of temperature. The hemoglobin content remained at 80 per cent. The Wassermann and Kahn tests were negative.

The anterior sinuses were definitely clear on transillumination, with the exception of the left frontal sinus, where the light was obstructed by the superficial swelling. It was noted specifically that the left antrum was clear.

Read at the Sixtieth Annual Congress of the American Laryngological Association, Atlantic City, N. J., May 2, 1938.

Positive Findings.—The various examinations yielded the following positive results:

1. The patient was admitted with a temperature of 97 F., which rapidly rose, to remain at 102 to 103 F. for seven days, lowering to between 99 and 100 F. for the succeeding seven days and then coming down to normal for the remaining eighteen days of her hospitalization.

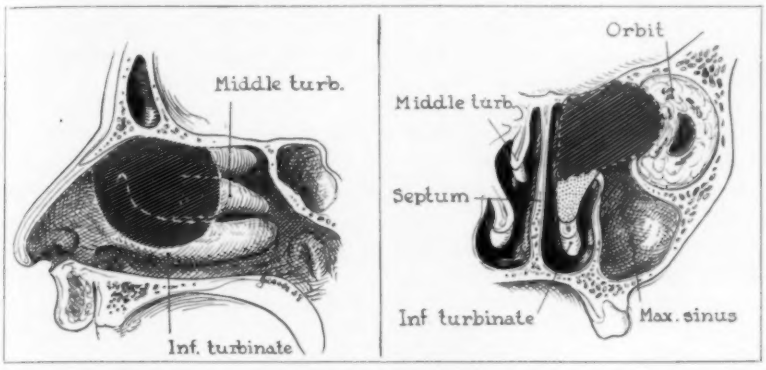

Fig. 1.—Sagittal and cross section of the area involved. The shaded area represents the extent of the process.

Fig. 2.—Area of bony absorption, indicated by the arrow.

2. The urine contained sugar (4 plus), acetone (4 plus) and diacetic acid (4 plus).

3. The sugar content of the blood was 298 mg. per hundred cubic centimeters.

4. There was present within the left side of the nose, the left ethmoid sinus and the left orbit a rapidly growing necrotic tumor, which within forty-eight hours showed evidence of involving the meninges and the left frontal cortex.

5. On the fifth day after the onset there was a complete motor paralysis of the right side of the body.

6. Biopsies were made of tissues taken from the left lateral wall of the nose and later from the intraorbital mass. The laboratory reports concerning these specimens were as follows:

A. Tissue from the nose: "The specimens are formed of necrobiotic tissue, in which are some glands, areas of abundant nuclear débris and perhaps some broken-down inflammatory cells. A fairly large number of septate and branching mycelia of a fungus is infiltrating almost every part of the specimen. The fungus cannot be definitely identified; it is probably a species of Monilia or of Aspergillus. Cultural study is necessary. There is no evidence of malignancy."

B. Tissue from the orbit: "The specimen is formed of necrobiotic muscle, fat tissue and a few nerve bundles. Some small areas of inflammatory reaction can be recognized. There is no evidence of malignant tumor. The fungus described in the tissue from the nose is present and is infiltrating all the tissue. It is abundant along the nerves. There is no doubt in my mind that this fungus is responsible for the necrobiotic and inflammatory swelling. Cultural study is necessary to identify the type."

7. The roentgenographic report was as follows: "There is a definite increase in density in the left ethmoid region, with blurring and loss of cellular outline; the other sinuses are clear. The density within the left orbit is increased."

DISCUSSION

In the light of these findings the following points are reviewed:

1. The patient had severe diabetes.

2. She had lost 28 pounds (12.7 Kg.) within four months, with nothing to explain it except the diabetes.

3. She denied having had any illness until the onset of her present symptoms and specifically stated that she had nothing wrong with her nose, sinuses or eye.

4. In the case of an apparently normal person, then, only five days elapsed from the onset of her first symptom, namely, a pain over the left eye, until she had a nonsuppurative, rapidly developing, fulminating process, characterized by the formation of a necrotic mass occluding the left side of the nose, the left ethmoid sinus, the left orbit and apparently the left side of the intracranial cavity.

5. Within the same period of five days she had lost the left eye, and complete motor paralysis of the right side of the body had developed.

6. Within twenty-one days all acute symptoms had subsided, leaving as their sequelae a receding mass in the left side of the nose, the left ethmoid sinus and the left orbit, complete loss of the left eye and total motor paralysis of the right side.

TREATMENT

1. Insulin was given every day. Although 160 units was administered the first day, the average daily dosage was about 75 units.

2. High voltage roentgen therapy directed anteriorly at the left orbit was given in doses of 210 Behnken's units on eight different occasions during the first two weeks.

3. Potassium iodide as a saturated solution was given in increasing doses for seventeen days, after which a rash appeared and administration of the solution was discontinued for eight days. When it was resumed with minimum doses, another rash developed after four days, and the treatment was discontinued. The initial daily dose was 2 Gm., and the maximum, 9 Gm.

4. Of the miscellaneous forms of therapy there were administered:

A. Antimony and potassium tartrate, 5 cc. on two occasions.

B. Fifty per cent solution of dextrose for reaction to insulin.

C. Sedatives and other symptomatic treatment.

Fig. 3.—Paralysis of the right arm and shoulder.

PRESENT CONDITION

Eight months after the onset, the condition of the patient is as follows:

She can walk about the room but is for the most part confined to an arm chair. The left eye is collapsed, degenerated and shrunken away from the nasal wall of the orbit. There is a perforation about ½ inch (1.27 cm.) in diameter in the anterior portion of the nasal aspect of the orbit, which communicates with the nose. This was partially occluded by a sequestrum, but there were no signs of active inflammatory process or of malignancy. Inspection of the nose revealed the same sequestrum in the left middle and inferior meatuses.

A part of this degenerated bone was removed through the orbital perforation and seemed to be a cast of the remainder of the left ethmoid labyrinth and left middle turbinate. Manipulation through the left side of the nose resulted in the removal of more sequestrum, until the whole area was clear, and the underlying tissue appeared to be normal.

Fig. 4.—Sequestrum in situ.

Fig. 5.—Sequestrum in situ—the eyeball degenerated and retracted from the lamina papyracea.

Fig. 6.—Sequestrum removed.

Fig. 7.—Pencil sketch of the patient made three weeks after the removal of the sequestrum.

Fig. 8.—A probe inserted through the orbital perforation in the external naris.

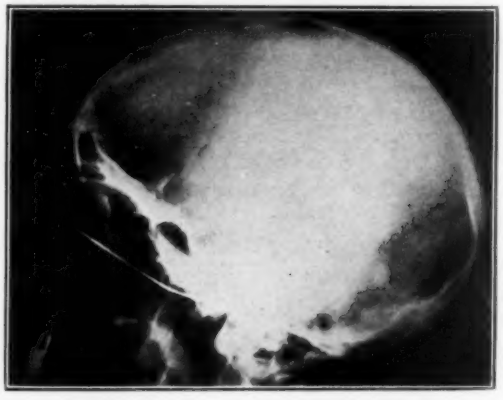

Fig. 9.—A probe inserted through the orbital perforation into the nasopharynx.

A light was passed through the orbital perforation into the nose and inspection under strong illumination carried out.

The right arm and shoulder are still completely paralyzed, and the right leg functions with a spastic gait; otherwise the muscular function on the right has returned. All reflexes on the right are increased. There are no sensory changes and no symptoms of intracranial pressure.

COMMENT

1. It is assumed that this condition was a fulminating infection due to Monilia or Aspergillus because the original bacteriologic studies showed an abundance of typical microscopic forms and nothing else to account for the condition. On the other hand, reculture of this material on regular and special mediums showed no growth; consequently this assumption is not verified.

2. It is not known what was the exciting cause or what part the diabetes played.

3. It is not known why the process was arrested. Certainly the treatment was empiric.

4. It is not known what happened intracranially, but the supposition is that there was a localized lesion in the meninges and the posterior aspect of the frontal lobe. In any case, the left motor area was involved whereas the adjacent sensory and speech areas were not involved.

5. The prognosis so far has shifted three times.

A. During the acute stage the condition was considered hopeless.

B. During the convalescence from the acute stage the prospect for recovery from the acute condition was considered fair, but recurrence was thought possible. The left eye was destroyed, and there was complete hemiplegia on the right.

C. At the present time the possibility of a recurrence of the acute condition seems doubtful. There is permanent loss of the left eye. In spite of the lack of demonstrable motor function in the right arm and shoulder, it seems possible that all motor function may return.

RECOVERY OF A PATIENT WITH TYPE III PNEUMOCOCCUS MENINGITIS OF OTITIC ORIGIN

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Type III pneumococcus meningitis is a disease so uniformly fatal that it appears of particular interest to report a complete recovery.

B. B., a boy aged 5½ years, was first admitted to the hospital on Oct. 9, 1937. The mother stated that two weeks previously the child had complained of pain in the right ear, for which ear drops were given and the child put to bed. The pain subsided in three days, and the patient was well thereafter until three days before his admission, when he again complained of pain in the right ear. The pain was accompanied by malaise. The temperature was 103 F. Tenderness and swelling were present behind the right ear.

On admission there was tenderness over the right mastoid, which was more marked over the zygomatic region. There was postauricular swelling, with displacement of the auricle and sagging of the superoposterior canal wall. There was a mucopurulent discharge from the external auditory canal. The temperature was 103.6 F. The leukocyte count was 19,000, with 90 per cent of polymorphonuclear cells. The urine was normal.

Immediate mastoidectomy was advised. It was performed the same afternoon. A postauricular incision was made extending down to the periosteum. As soon as the periosteum over the antrum was elevated, a gret deal of pus welled up through a perforated cortex. The lesion in the cortex extended forward toward the zygoma. The cells were filled with pus, but the intercellular structure was not destroyed. The tegmen antri was soft, and was removed. The dura was normal in appearance. Culture of pus from the mastoid yielded Pneumococcus type III.

The postoperative course was uneventful. Four days after the operation the sutures were removed; the mastoid wound was clean. From October 14 the patient was afebrile, and he was discharged apparently well on October 19, ten days after admission.

The day after his discharge the child had a frontal and occipital headache and vomited. The next day (October 21) he appeared comfortable and did not complain, although he had a congested pharynx, subacute tonsillitis and an inflammation of the left ear. Two days later the mastoid wound was dressed and was found to be clean. On October 24 he again complained of severe frontal headache, and finally, on October 25, he was readmitted to the hospital acutely ill. The temperature was 102.4, and he complained of severe frontal headache.

From the Oto-Laryngologic Service of the Israel-Zion Hospital, Samuel J. Kopetzky, M.D., director.

The careful laboratory studies were performed under the direction of Dr. L. Rosenthal, director of laboratories at the Israel-Zion Hospital.

Examination disclosed slight puffiness over the zygoma, the mastoid wound being clean. The neck was slightly rigid, and there was a questionable Kernig sign. The deep reflexes were hyperactive; the abdominal and the cremasteric reflexes were present. The Babinski sign was absent. The examination otherwise gave negative results. The eyegrounds were normal.

Roentgenograms of the petrous pyramid taken the day of admission were unsatisfactory. Roentgenograms of the mastoid taken the next day were interpreted as follows: "The left mastoid shows no evidence of pathologic change. On the right, most of the cells are absent, although there are a few cells in the posterior region of the body and the area of the tips. There is no evidence of any breaking through of the tegmen. The wall of the sinus is clearly demarcated."

Spinal tap, performed the same day, yielded cloudy fluid under increased pressure (32 mm. of mercury), 20 cc. being withdrawn. Daily lumbar punctures were performed thereafter, from 15 to 25 cc. being removed. The spinal fluid findings, as well as other laboratory data, including temperature and total and differential leukocyte counts throughout the clinical course, are presented in the table. Cultures of the spinal fluid yielded Pneumococcus type III on three occasions (October 30, November 7, November 30).

Sulfanilamide therapy was instituted on October 25, doses of 40 grains (2.6 Gm.) being given daily. Frequent small transfusions were given, as indicated in the table, totaling 510 cc. in three weeks.

Surgical exploration was contemplated, but it was not carried out immediately, because of a seeming improvement obtained by spinal tap and administration of sulfanilamide.

Clinically the patient appeared comfortable during the first few days, the only new development being the appearance of a morbilliform rash over the chest and shoulders on October 28, possibly due to sulfanilamide, although sulfanilamide rash most often occurs about ten days after administration of the drug.

In view, however, of the persistence of meningeal signs and an increase in the cell count of the spinal fluid, it was decided to explore the mastoid wound. On November 2 the old wound was reopened and was enlarged over the zygoma, in which a few cells containing granulations were found. The zygoma was entirely exenterated. The inner table over the temporosphenoid lobe, the cerebellum and the lateral sinus was removed. This was very soft and necrotic in spots, no bone being preserved except that of the petrous pyramid and the labyrinth. The operative diagnosis was probable osteomyelitis of the inner table of the mastoid. No histologic examination, however, was made.

After the operation the patient improved rapidly. By November 6 the spinal fluid was found to be clear, and it remained intermittently clear thereafter. The patient improved clinically, and he was afebrile after November 18, rigidity of the neck and the Kernig sign also disappearing about this time. The operative wound healed uneventfully, and the patient was discharged, apparently entirely well, on December 2.

COMMENT

It is fortunate indeed that pneumococcic meningitis is an infrequent disease, for results of treatment heretofore have been most discouraging. In a study of 468 cases observed during a ten year period in the state charity hospital of Louisiana, Tripoli [1] reported an incidence

1. Tripoli, C. J.: Bacterial Meningitis: A Comparative Study of Various Therapeutic Measures, J. A. M. A. **106**:171 (Jan. 18) 1936.

Clinical and Laboratory Data in a Case of Type III Pneumococcus Meningitis with Recovery

Date	Spinal Fluid: Appearance Pressure	Spinal Fluid: Cells, per Cu. Mm.	Spinal Fluid: Percentage Polymorphonuclears	Spinal Fluid: Sugar	Spinal Fluid: Albumin	Spinal Fluid: Globulin	Spinal Fluid: Culture	Temperature: High	Temperature: Low	White Blood Count: Total	White Blood Count: Polymorphonuclears, %	White Blood Count: Immature, %	Total Hemoglobin, %	Methemoglobin, Gm. per 100 Cc.	Blood Sulfanilamide, Mm. per 100 Cc.	Spinal Fluid Sulfanilamide	Sulfanilamide Dose, Grains	Transfusions, Cc.
10/25/37.....	Cloudy 32 Hg	4,400	100	+	0	±	Neg.	102.5	100.5	20,690	90	..	....	...	....	....	40	..
10/26/37..... ..	Cloudy	400	84	+	0	±	Neg.	99.6	99.0	7,650	64	6	....	...	....	....	40	..
10/27/37.....	Cloudy	800	95	+	0	±	Neg.	100.0	99.0	.....	..	..	....	...	....	....	40	60
10/28/37.....	Cloudy	400	85	+	0	±	Neg.	101.4	100.3	9,600	69	10	13.8	1.7	....	....	40	..
10/29/37.....	Cloudy	2,650	100	+	±	±	Neg.	102.0	99.0	.....	..	..	....	...	....	....	40	50
10/30/37.....	Cloudy	4,100	100	+	+	±	Pneumococcus type 3	99.8	99.2	8,770	71	..	14.0	1.1	....	....	40	..
10/31/37.....	Cloudy	6,400	100	+	0	±	Neg.	99.2	99.0	15,050	74	9	....	...	....	....	40	..
11/ 1/37.....	Cloudy	860	86	+	+	0	Neg.	104.4	101.0	31,500	75	15	13.7	0.3	....	....	40	50
11/ 2/37.....	Cloudy	4,000	95	+	+	±	Neg.	100.2	99.8	13,200	67	19	....	...	....	....	40	..
11/ 3/37.....	Cloudy	1,100	95	+	+	±	Pneumococcus type 3	101.5	99.7	.....	..	..	....	...	....	....	40	..
11/ 4/37	Slightly cloudy	1,280	85	+	+	±	Neg.	102.0	101.0	.....	..	..	....	...	....	....	40	50
11/ 5/37.....	Slightly cloudy	550	92	+	+	+	Neg.	103.4	100.4	.....	..	..	10.3	0.2	....	....	40	..
11/ 6/37.....	Almost clear	60	76	+	+	±	Neg.	100.0	99.0	16,400	67	13	....	...	....	....	40	..
11/ 7/37.....	Clear	70	64	+	+	±	Pneumococcus type 3	99.8	99.2	.....	..	..	....	...	....	....	40	50
11/ 8/37.....	Clear	6,250	95	0	+	+	Neg.	100 0	99.2	.. ...	..	..	10.6	0.5	....	....	40	..
11/ 9/37.....	Clear	2,100	95	+	0	±	Neg.	104.0	99.5	18.000	63	11	....	...	....	....	40	..
11/10/37.....	Slightly cloudy	200	90	+	±	±	Neg.	101.0	99.5	10,660	65	..	....	...	....	....	40	..
11/11/37.....	Slightly cloudy	390	100	+	+	±	Neg.	100.4	99 0	.....	..	..	8.6	0.5	5.88	....	40	200
11/12/37.....	Clear	270	85	+	±	0	Neg.	100.0	99 0	7,200	57	..	....	...	....	....	40	..
11/13/37.....	Cloudy	160	90	+	±	0	Neg.	101.0	99.5	6,700	58	..	....	...	....	....	40	..
11/14/37.....	Clear	200	100	+	+	±	Neg.	102.0	99.6	.....	..	..	....	...	....	....	40	..
11/15/37.....	Cloudy	80	50	+	+	±	Neg.	103.5	102.0	.....	..	..	11.0	0.7	....	....	50	..
11/16/37.....	Clear	.....	...	..	..	..	.....	102.0	101.4	10,200	73	13	....	...	....	8.18	60	..
11/17/37†.....	Clear	.....	...	..	..	..	.....	100 0	99.5	7,600	60	14	....	...	....	....	60	..
11/18/37.....	.....	.....	...	..	..	..	.....	99.0	98.6	5,300	50	9	8.9	0.2	....	4.18	60	50
11/19/37.....	.....	.....	...	..	..	..	.....	99.0	98.5	.....*	..	..	9.1*	...	10-14*	....	60*	..

* Further course: Afebrile to discharge. White blood count: 11/20, 7,200, 48 per cent polymorphonuclears, 12 immature forms; 11/22, 7,900, 60 per cent polymorphonuclears; 10 immature forms; 11/24, 5,800, 41 per cent polymorphonuclears, 12 immature forms; 11/27, 8,000, 50 per cent polymorphonuclears, 6 immature forms. Methemoglobin: 11/22, 0.6 Gm.; 11/24, 0.4 Gm.; 11/26, 0.4 Gm.; 11/29, 0.0 Gm. Concentration of sulfanilamide: 11/22, 9.5 mg. per hundred cubic centimeters; 11/24, 9.23 mg. per hundred cubic centimeters. Sulfanilamide dose: 60 grains daily to 11/24, 30 grains daily thereafter to discharge.

† Occasional nucleated red blood cell; achromia.

of 111, or 23.7 per cent, of cases of pneumococcic meningitis, in 8 of which the organism was Pneumococcus type III. In these 111 cases there was only 1 recovery, the condition in this case not being due to the type III pneumococcus. Neal [2] found 66 cases of pneumococcic meningitis in a series of 1,259 cases of meningitis. In 8 of these the disease was due to Pneumococcus type III. Of the last 100 cases of meningitis reported to the New York city department of health, 22 were cases of pneumococcic meningitis; the mortality was 100 per cent. Neal [3] informed me that in her extensive experience she has seen no recoveries from type III pneumococcus meningitis.

OTITIC ORIGIN OF PNEUMOCOCCIC MENINGITIS

In a recent comprehensive study, Neal [4] and her colleagues found that in 75, or 35 per cent, of 214 cases of pneumococcic meningitis the condition was of otitic origin or arose in the paranasal sinuses. "Type III was most commonly found in meningitis secondary to otitis media, mastoiditis and sinusitis." In 35, or 75 per cent, of 47 cases of type III pneumococcus meningitis the condition was of otitic origin or arose in the paranasal sinuses, cases of type III pneumococcus meningitis comprising 55 per cent of all cases of meningitis of otitic or sinal origin.

Williams,[5] analyzing 597 cases of meningitis in which the condition was due neither to meningococci nor to tubercle bacilli, emphasized the otitic background, concluding that "the great majority of these cases occur after middle ear and sinus infections."

PREVENTION OF TYPE III PNEUMOCOCCUS MENINGITIS

The gravity of meningeal infection due to the type III pneumococcus, once established, has led quite properly to an attempt at prophylaxis by more adequate treatment of the antecedent otitis. Shambaugh [6] urged energetic surgical attack on the infected mastoid when beginning meningitis is suspected, recommending thorough drain-

2. Neal, J., in Tice, F.: Practice of Medicine, Hagerstown, Md., W. F. Prior Company, Inc., 1920, vol. 10, chap. 15, p. 255; cited by Goldstein, H. I., and Goldstein, H. Z.: Pneumococcus Meningitis and Endocarditis, Internat. Clin. **3**:155 (Sept.) 1927.

3. Neal, J.: Personal communication to the author.

4. Neal, J.; Jackson, H. W., and Applebaum, E.: A Comprehensive Study of Meningitis Secondary to Otitic or Sinus Infection, Ann. Otol., Rhin. & Laryng. **43**:658 (Sept.) 1934.

5. Williams, A. W.: Bacteriology of Meningitis Following Otitis Media and Related Infections, Ann. Otol., Rhin. & Laryng. **43**:667 (Sept.) 1934.

6. Shambaugh, G. E., Jr.: The Surgical Treatment of Meningitis of Otitic and Nasal Origin, J. A. M. A. **108**:696 (Feb. 27) 1937.

age and wide exposure of the dura over the tegmen of the middle ear and mastoid. Kopetzky[7] likewise recommended: "Where in an otogenic lesion meningeal involvement is surmised . . ., the surgical removal of the entire visceral side of the temporal bone is indicated as far as that is surgically possible."

The frequent inadequacy of surgical procedures alone in the treatment of type III pneumococcus otitis has stimulated an attempt to increase the resistance of the host by active immunization. Goldman and Herschberger,[8] using autogenous type III pneumococcus vaccine, reduced the incidence of intracranial complications and thereby the mortality of acute mastoiditis due to Pneumococcus type III from 32.5 per cent to less than 10 per cent.

REPORTED RECOVERIES FROM PNEUMOCOCCIC MENINGITIS

The lesion established, neither surgical treatment nor immunization is of any considerable avail. Mortality for all types of pneumococcic meningitis is extremely high, in some large series up to 100 per cent. Otitic pneumococcic meningitis is of particular severity. Kolmer[9] in 1926 reviewed his experiences over a seven year period with 41 cases of pneumococcic meningitis of otitic or nasal origin, in all of which the patients died.

Goldstein and Goldstein,[10] reviewing the literature to 1927, estimated that there are on record about 150 recoveries from proved pneumococcic meningitis. Reveno and McLaughlin[11] listed 15 additional recoveries, including 1 in a case of their own, reported by various authors from 1927 to 1934. Mertins and Mertins,[12] in a recent survey of the literature for the past fifteen years, found reports of 30 recoveries from pneumococcic meningitis.

Recovery has been attributed to various measures, no one of which, however, has been successful except in isolated instances. These measures include:

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7. Kopetzky, S. J.: Newer Concepts of Otogenic Meningitis, Laryngoscope **45**:827 (Nov.) 1935.

8. Goldman, J. L., and Herschberger, C.: Vaccination Against Intracranial Complications Following Mastoiditis, J. A. M. A. **109**:1254 (Oct. 16) 1937.

9. Kolmer, J. A.: Chemotherapy and Serum Therapy of Pneumococcus and Streptococcus Meningitis, Arch. Otolaryng. **3**:481 (June) 1926.

10. Goldstein, H. I., and Goldstein, H. Z.: Pneumococcal Meningitis and Endocarditis, Internat. Clin. **3**:155 (Sept.) 1927.

11. Reveno, W. S., and McLaughlin, N.: Pneumococcus Meningitis: Recovery with Felton's Serum, Ann. Int. Med. **7**:1027 (Feb.) 1934.

12. Mertins, P. S., and Mertins, P. S., Jr.: Meningitis Due to the Type IV Pneumococcus with Recovery, Arch. Otolaryng. **25**:657 (June) 1937.

1. Forced spinal and cisternal drainage (Globus and Kasanin,[13] Bedell,[14] Meyer [15]).

2. Use of homologous pneumococcus antiserum (Williams,[5] Reveno and McLaughlin,[11] Harkavy [16]).

3. Use of nonspecific serum, antipneumococcus and antimeningococcus (Cavenagh,[17] Steinholz and Gleich [18]).

4. Administration of ethylhydrocupreine hydrochloride U. S. P. (Ratnoff and Litvak [19]).

5. Use of various antiseptics intraspinally—methenamine (Roussel,[20] Bratesco and Moga,[21] mercurochrome (McAskill [22]) and acriflavine hydrochloride (Fleischmann [23]).

6. Nott's treatment with enemas of potassium permanganate solution (Weinberg [24]).

Spontaneous recovery has been reported (Ravenel [25]).

That these measures are most often ineffectual is shown by Kolmer and Idzumi,[26] who treated 11 patients with intraspinal injections of ethylhydrocupreine hydrochloride U. S. P. alone or in combination

13. Globus, J. H., and Kasanin, J. I.: Pneumococcic (Type IV) Meningitis, J. A. M. A. **90**:599 (Feb. 25) 1928.

14. Bedell, C. C.: Pneumococcic Meningitis: Report of a Case with Recovery Following Cisternal Drainage, J. A. M. A. **102**:820 (March 17) 1935.

15. Meyer, P. R.: Pneumococcic Meningitis: Report of a Case with Recovery Following Cisternal Drainage, J. A. M. A. **105**:1844 (Dec. 7) 1935.

16. Harkavy, J.: Pneumococcic Meningitis: Recovery with Serum Therapy, J. A. M. A. **90**:597 (Feb. 25) 1928.

17. Cavenagh, J. B.: Recovery from Pneumococcal Meningitis, J. Laryng. & Otol. **48**:337 (May) 1933.

18. Steinholz, R., and Gleich, M.: Pneumococcus (Type III) Meningitis: Recovery, J. A. M. A. **105**:795 (Sept. 7) 1935.

19. Ratnoff, H. L., and Litvak, A. M.: Pneumococcus Meningitis Treated with Morgenroth's Optochin Hydrochloride: Report of a Case with Recovery, Arch. Pediat. **43**:466 (July) 1926.

20. Roussel, A. E.: Pneumococcal Meningitis Simulating Diabetic Coma with Recovery, Atlantic M. J. **30**:159 (Dec.) 1926.

21. Bratesco, V., and Moga, N.: Oto-mastoïdite aigue pneumococcique gauche avec méningite pneumococcique; opération; guérison, Ann. d'oto-laryng., June 1936, p. 574.

22. McAskill, J. E.: Treatment of Purulent Leptomeningitis Secondary to Otitis Media, Ann. Otol., Rhin. & Laryng. **35**:502 (June) 1926.

23. Fleischmann, O.: Zur Frage der Sero- und Chemotherapie der otogenen und rhinogenen Meningitis, Klin. Wchnschr. **1**:217 (Jan. 28) 1922.

24. Weinberg, M. H.: Case of Pneumococcus (Type III) Meningitis Treated with Potassium Permaganate; Recovery, J. Nerv. & Ment. Dis. **74**:38, 1931.

25. Ravenel, S. F.: Spontaneous Recovery from Pneumococcal Meningitis: Report of a Case in a Newborn Infant, South. M. J. **29**:86 (Jan.) 1936.

26. Kolmer, J. A., and Idzumi, G.: Chemotherapeutic Studies with Ethylhydrocuprein and Mercurophen in Experimental Pneumococcus Meningitis in Rabbits, J. Infect. Dis. **26**:355 (April) 1920.

with homologous antiserum, without a single recovery. Musser [27] reported 18 cases of pneumococcic meningitis in which the condition was treated by combined cisternal and lumbar puncture, lavage and injection of serum, all of which terminated fatally. Tripoli [1] likewise had no success with any of these measures, only 1 recovery occurring in 111 cases of pneumococcic meningitis.

Tripoli,[1] Musser [27a] and Neal [27b] have all warned of the dangers of indiscriminate use of heroic measures, such as intrathecal medication with various chemicals and cisternal drainage. Tripoli reported that several deaths occurred so quickly after intraspinal administration of a chemical agent, such as ethylhydrocupreine hydrochloride U. S. P. or one of various antiseptics, that this practice was discontinued. Musser and Neal emphasized the danger of cisternal tap, Neal citing from 25 to 30 deaths caused by cisternal puncture. Neal and her colleagues [4] stated:

> . . . the most important therapeutic factor, aside from the removal of the primary foci of infection, is adequate drainage of the cerebrospinal fluid. Unless there is blocking, this can be accomplished by lumbar puncture. There is no evidence that the more radical forms of drainage are more effective. A greater number of recoveries has followed ordinary spinal drainage than any other form of treatment.

RECOVERY FROM TYPE III PNEUMOCOCCUS MENINGITIS

Of all the types of pneumococcic meningitis, that caused by Pneumococcus type III is the most severe. Its severity is probably due both to the greater pathogenicity of the organism and to the fact that the disease is most often of otitic origin, otogenous meningitis in general offering a particularly poor prognosis. Furthermore, specific antiserum has not proved as effectual against type III pneumococci as it has against other types, such as type I.

In all, there have been reported only 5 recoveries from this type of pneumococcic meningitis. Allman [28] recently reported a recovery and found 4 other cases in reviewing the literature. In his case meningitis occurred after radical mastoidectomy and labyrinthectomy for cholesteatoma with long-standing otitis and labyrinthitis. Allman stated that the organism in his case, and probably in the case of other reported recoveries, was of low virulence. In the case reported by Steinholz and Gleich [18] meningitis occurred in the course of post-traumatic subacute purulent otitis media. The meningitis was mild, the cell count of the

27. Musser, J. H.: Treatment of Acute Infectious and Contagious Diseases, J. A. M. A. **88**:1125 (April 9) 1927.

27a. Musser, J. H.: in discussion on Tripoli.[1]

27b. Neal, J. B., in discussion on Tripoli.[1]

28. Allman, C. H.: Meningitis Due to the Type III Pneumococcus, Arch. Otolaryng. **25**:653 (June) 1937.

spinal fluid reaching only 200 per cubic millimeter. The organism was of greatly attenuated virulence, since mice into which specimens of spinal fluid from the patient were injected did not die.

In these cases, then, recovery is to be ascribed to the low virulence of the organism and to an increased resistance of the host established in the course of a long-preceding otitis. Kopetzky [7] remarked:

> The very poorest results from meningitis are found in those cases in which mastoidectomy was necessary during the first week of the middle ear infection. Obviously the stormy and alarming clinical picture makes necessary the early mastoidectomy, and the stormy clinical picture heralds the advent of the meningitis. The mastoidectomy per se seems not to inhibit the development of a meningeal lesion. Cases which occur as sequelae of middle ear chronicities are again to be comprehended as of a different origin and different nature.

The case reported here falls in the first of these categories, the meningitis following rapidly on acute mastoiditis for which simple mastoidectomy had been performed.

In view, therefore, of the severe nature of the meningitis in this case, it is of interest to inquire into the measures which may have contributed to the cure. These included a daily lumbar tap with drainage to relieve pressure, a procedure recommended by Neal, as has been noted. Small blood transfusions were given, as advocated by Kopetzky, and complete eradication of the possible focus was performed. In addition, sulfanilamide therapy was employed.

USE OF SULFANILAMIDE FOR PNEUMOCOCCIC INFECTIONS

Rosenthal [29] found sulfanilamide a potent therapeutic agent in the treatment of experimental pneumococcic infection with virulent strains in mice, in rabbits and particularly in rats. The curative action was most evident with type III pneumococcus infections. Rosenthal concluded that "up to the present time no other compounds have been found as effective against pneumococcic infections as sulfanilamide."

Gross and Cooper [30] also obtained favorable results with sulfanilamide in treating type III pneumococcus infections in rats.

Long and Bliss [31] reported:

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29. Rosenthal, S. M.: Studies in Chemotherapy: Chemotherapy of Experimental Pneumococcus Infections, Pub. Health Rep. **52**:48 (Jan. 8) 1937. Rosenthal, S. M.; Bauer, H., and Branham, S. E.: Comparative Studies of Sulphanilamide Compounds in Experimental Pneumococcus, Streptococcus and Meningococcus Infections, Pub. Health Rep. **52**:662 (May 21) 1937.

30. Gross, P., and Cooper, F. B.: Efficacy of *p*-Aminobenzenesulfonamide in the Experimental Type III Pneumococcus Pneumonia of Rats, Proc. Soc. Exper. Biol. & Med. **36**:225 (March) 1937.

31. Long, P. H., and Bliss, E. A.: The Use of Para-Aminobenzine-Sulphanamide (Sulphanilamide) or Its Derivatives in the Treatment of Infections Due to Beta Hemolytic Streptococci, Pneumococci and Meningococci, South. M. J. **30**:479 (May) 1937.

Our experience in the treatment of clinical pneumococcal infections in human beings has been primarily limited to those of the middle ear and mastoid. Our observations tend to show that sulfanilamide has about one half the chemotherapeutic effect in pneumococcal infections that it has in hemolytic streptococcal infections of the middle ear and mastoid.

Mertins and Mertins [12] recently reported a case of unclassified type IV pneumococcus meningitis of otitic origin in which the patient recovered after sulfanilamide therapy.

The mode of action of sulfanilamide is still mooted. Rosenthal [32] stated:

The bacteriologic and bactericidal action of sulphonamide on pneumococci in vitro is adequate to explain its chemotherapeutic effect in animals. The nature of this action in vitro is unusual in that the drug is not an antiseptic in the usual sense.

Long and Bliss, however, remarked:

We can only conclude that a change takes place in the organism which renders them susceptible to phagocytosis, but the nature of this change is still unknown. Certainly we have no evidence that the bacteriostasis observed in vitro plays an important role in vivo. It is important to note, however, that the change brought about by the sulfanilamide therapy is not instantaneous, but requires a period of several hours before it begins to develop. This suggests the possibility of a union between the organism and chemical by which a marked change in the metabolism of the streptococcus is brought about. We believe that sulfanilamide exerts its action upon the streptococci rather than upon the leucocytes.

Branham and Rosenthal [33] found that the curative effect of sulfanilamide or of homologous antiserum alone on experimental pneumococci infection in mice is greatly enhanced by the combined use of serum and sulfanilamide.

Long and Bliss [31] have emphasized the importance of adequate dosage checked by estimation of the concentration of sulfanilamide in the blood, a level of from 8 to 10 mg. per hundred cubic centimeters being desirable for full therapeutic effect. The dose of from 40 to 60 grains (2.6 to 3.9 Gm.) daily used in this case accords with Long and Bliss's recommended dose for children weighing from 25 to 50 pounds (11.3 to 22.7 Kg.). Sulfanilamide determinations by the method of Marshall [34] showed concentrations of 5.88, 10.14, 9.5 and 9.22 mg. per

32. Rosenthal, S. M.: The Effect of p-Aminobenzine Sulphonamide on Pneumococci in Vitro, Pub. Health Rep. **52**:192 (Feb. 12) 1937.

33. Branham, S. E., and Rosenthal, S. M.: Sulphanilamide, Serum and Combined Drug and Serum Therapy in Experimental Meningococcus and Pneumococcus Infections in Mice, Pub. Health Rep. **52**:685 (May 28) 1937.

34. Marshall, E. K., Jr.; Emerson, K., and Cutting, W. C.: Para-Aminobenzenesulfonamide: Absorption and Excretion; Method of Determination in Urine and Blood, J. A. M. A. **108**:953 (March 20) 1937.

hundred cubic centimeters of blood. Values for the spinal fluid were of a similar range, the concentrations on two occasions being 8.18 and 4.18 mg. per hundred cubic centimeters. Marshall and his colleagues [34] showed that sulfanilamide is absorbed completely from the gastrointestinal tract in four hours and is found in the spinal fluid (as well as in other body fluids) in only slightly lower concentrations than in the blood within a few hours of administration. They suggested, therefore, that the drug be given orally when its presence in the cerebrospinal fluid is desired.

USE OF BLOOD TRANSFUSIONS

Sulfanilamide has occasionally been indicated [35] for its deleterious effect on hemoglobin. Frequent estimations of total hemoglobin content and methemoglobin content were therefore made throughout the course of the illness. The highest levels of methemoglobin were found in the first week of illness, namely, 1.7 and 1.1 Gm per hundred cubic centimeters of blood. Later estimations varied from 0.2 to 0.7 Gm.

The total hemoglobin content, initially 14 Gm., fell during the course of the meningitis to 9 or 10 Gm., and frequent transfusions of whole blood were given to maintain the hemoglobin level, a total of 510 cc. in seven doses being given during a three week period.

Kopetzky [7] has indicated that transfusion may be of direct value in the treatment of purulent meningitis. In studying the effect of the transfusion on the chemistry of the cerebrospinal fluid, he found:

> . . . the transfusions seemed to bring the p_H toward the normal, increase the chlorides and carbonates and markedly lessen the lactic acid content of the fluid. In other words . . . there seems to be a trend toward the normal chemical content produced in the pathologic fluid by transfusion of whole blood.

CONCLUSIONS

When the presence of otitic meningitis is suspected, it becomes of prime importance that every possible focus in the component parts of the temporal bone be first surgically removed. It is almost impossible to localize these foci macroscopically; therefore, the removal of probably diseased areas should be made as far and as wide as possible. Thereafter the use of chemotherapy and the giving of support to the tissues by transfusion are in order. Regarding chemotherapy, sulfanilamide appears to be a valuable agent in the treatment of type III pneumococcus meningitis. Oral administration is satisfactory, as sulfanilamide is distributed almost evenly through all body fluids, including the spinal fluid. Adequate doses are necessary for full therapeutic effect and should be given with the object of main-

35. Kohn, S. E.: Anemia During Treatment with Sulfanilamide, J. A. M. A. **109**:1005 (Sept. 25) 1937.

taining a concentration level in the blood of from 8 to 10 mg. per hundred cubic centimeters.

Since type III pneumococcus meningitis is most frequently of otitic or sinal origin, the most promising approach is to be sought in prophylaxis by adequate surgical treatment fortified by injection of type III pneumococcus vaccine, as recommended by Goldman.

Once the lesion is established, sulfanilamide therapy appears to offer the greatest specific benefit. It should be supplemented by daily spinal drainage to relieve pressure and by frequent small blood transfusions. Type III pneumococcus antiserum may also be of some value, and there is evidence that the effects of sulfanilamide and serum are additive.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

THE PARANASAL SINUSES

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The otolaryngologic literature for 1937 still manifests a trend toward conservatism in treatment. Operations on the sinuses are becoming more standardized, and there are fewer variations of the well known procedures. Operative failures are being brought into the open for discussion, and as a result one may expect a clearer conception of the indications and limitations of the various operations.

There have been more reports on osteomyelitis than in former years, and the subject of fractures involving the sinuses is thoroughly discussed in several interesting articles. Interest in the latter will doubtless increase because of the large numbers of automobile accidents.

ANATOMY-EMBRYOLOGY

Honda [1] has written three papers on the anatomic structure, the histologic appearance and the embryologic development of the sinuses, his studies being based on serial sections of 52 Japanese embryos ranging from 7 to 40 weeks in age. While most of the facts disclosed have long been known, some points are brought out which should be of general interest. Honda finds that the epithelium of the meatuses which begins forming in the eighth week is already arranging itself in layers and increasing in height. In the eleventh week subepithelial capillaries are seen in the respiratory region which are the beginning of the formation of "swell bodies." In the twelfth week the capillaries in the mesenchyme in the vicinity of the perichondrium are distinct, as are those about the developing periosteum. Cilia appear on the epithelial cells of the rudimentary maxillary sinus in the fourteenth week. The epithelium differentiates into layers about the

1. Honda, T.: Entwicklungsgeschichtliche Studien über die Nebenhöhlen der Nase bei menschlichen Embryonen, Nagasaki Igakkwai Zassi **15**:1144 (July 25) 1937; Histologische Studien über die Nebenhöhlen der Nase bei menschlichen Embryonen, ibid. **15**:1381 (Aug. 25) 1937; Beziehungen der Nasennebenhöhlen der japanischen Embryonen mit der äusseren Nase, dem Schädel und ihrer eigenen nächsten Umgebung, ibid. **15**:1397 (Aug. 25) 1937.

nineteenth week, but globlet cells do not appear until the end stage of the embryo. The anlage of the mucous glands can be seen in one corner of the primitive maxillary sinus in the ninth week; however, it is not until the fourteenth week that the glands become branched into typical tubuloacinous form. The author describes the appearance and development of the various meatuses and turbinals, showing the various stages of their growth and their relation to the development of the sinuses. Discussing the appearance of the most anterior ethmoid cells, Honda states that he saw no indication of a frontal sinus ever developing from these cells. His specimens all showed the frontal sinus arising from the frontal recess, which appears in the eighth week and begins pouching in the thirteenth or the fourteenth week. Its shape is extremely variable and its growth much slower than that of the first three ethmoid cells, which also arise from the frontal recess.

The general direction of growth of the frontal and ethmoid sinuses is forward; that of the maxillary and sphenoid sinuses, backward. The author points out that at the end of the embryonal period the sinuses are found to have developed to varying degrees, but never does a solitary cell develop from one sinus or cell nor does a cell become entirely isolated from the beginning. Up to the twentieth week the various sinuses and cells maintain their infantile shape. From the twenty-eighth week on they gradually take on more complicated forms. Despite the variety of shapes and sizes which they assume, their original points of origin, namely, the first and second principal folds, are nearly always uniform.

Blair [2] presented before the fifty-ninth annual congress of the American Laryngological Association a number of interesting congenital anomalies of the nose which were associated with displacement of the lids and eyeball. In 1 patient there was no evidence of a mucosa-lined cavity that might have represented the antrum. In several other patients a mucosa-lined cavity was found with its duct displaced or entirely absent. Speculation as to the source from which the mucosa was derived led to the observation that "lacking embryological data, one might imagine a nasal duct attached above directly to the upper canaliculus or to a rudimentary sac, the lower canaliculus being entirely absent."

Roentgen studies of the sinuses during infancy and early childhood by Knutsson [3] revealed the following facts: In the newborn the ethmoid portion of the nose forms two thirds of the total height of the

2. Blair, V. P.: Observations on Sinus Abnormalities in Congenital Total and Hemi-Absence of the Nose, Ann. Otol., Rhin. & Laryng. **46**:592 (Sept.) 1937.

3. Knutsson, F.: Sinuses During the First Years of Life, Nord. med. tidskr. **13**:606 (April 17) 1937.

nasal cavities and the maxillary sinus one third; in the adult they are equally divided, because the maxillary sinus, growing more rapidly, attains its full height through its growth downward, while at the same time the choanae are increasing in height. Knutsson, like Honda, calls attention to the embryologic fact that the sphenoid sinus is really a pinched-off portion of the nasal cavity proper, whereas all the other sinuses develop from recesses in the primitive lateral nasal wall.

Ennis [4] has written an illuminating article, profusely illustrated, which demonstrates the variations in the size of the maxillary sinus and its pockets or extensions in relation to the nasal cavity and the teeth. This article is developed along the lines of a previous communication by the same author but is written particularly for the benefit of the orthodontist and the general dentist. The significance of the alveolar, palatine, zygomatic and infraorbital extensions as well as the exceptional tuberosity and intermolar extensions is elaborated with the idea of demonstrating how to differentiate these spaces from cysts or areas of softened bone in relation to the teeth. Incorrect diagnoses have often been made because of insufficient knowledge of the variations mentioned and of their roentgenographic appearance. The author shows the value of the occlusal roentgenogram and gives detailed directions for the technic. Roentgenograms taken in three positions are shown, each of which delineates a particular portion of the sinus and furnishes information not obtainable in the usual projections. Ennis points out the importance of showing the typical Y formed by the nasoantral wall at the point where the nasal cavity continues anteriorly while the anterior wall of the sinus curves away from it in a lateral direction. The recognition of this line is of great assistance in differentiating alveolar extensions of the sinus from a cyst in this region. Nutrient canals are also located so that they may not be mistaken for pathologic changes in the bone.

Mangabeira-Albernaz [5] expresses surprise that textbooks fail to mention the maxillofrontal canal. Even Zuckerkandl, Hajek and Gruenwald make no reference to this structure. Bryan is credited with the first description of it, and Vilar Fiol, with the first extensive study. It is described as a deep groove or incomplete bony canal directly connecting the frontal and maxillary sinuses. Fillibrown studied the structure at the suggestion of Bryan and stated that the "infundibulum instead of ending in the middle meatus continues downward in the

4. Ennis, L. M.: Roentgenographic Variations of the Maxillary Sinus and the Nutrient Canals of the Maxilla and the Mandible, Internat. J. Orthodontia **23**:173 (Feb.) 1937.

5. Mangabeira-Albernaz, P.: O conduto maxilo-frontal, Rev. oto-laring. de São Paulo **4**:373 (Sept.-Oct.) 1936; Le canal maxilo-frontal, Rev. de laryng. **58**: 77 (Jan.) 1937.

form of a semicanal ending directly in the maxillary ostium." Fiol found the canal present in 20 per cent of 140 patients examined. The author, however, in a series of 68 patients found only 2 in whom there was a structure which conformed to that described by Fiol. In both instances the maxillary end of the canal was discovered in the course of a radical operation on the antrum through a clump of granulation tissue in the posterior superior part of the nasoantral wall just above the ostium, which when cleared away revealed a depression or fossa. A sound passed into it slipped readily forward and upward and was demonstrated roentgenographically to have reached the frontal sinus. The clinical significance of the finding lies in the fact that unless the canal is freed of all pathologic tissue one may expect a recurrence of the symptoms for which the original operation was done.

Roentgen studies of 102 Japanese skulls (i. e., 204 sinuses) by Murai [6] disclosed a higher incidence of double frontal sinuses than in the white race, viz., 6.8 per cent as against 2.5 per cent. He found as many as 5 separate frontal sinuses in one head. The first, or primary, sinus is more medial and higher than the second, or accessory, sinus, which is usually broader and deeper. The primary sinus always opens into the frontal recess, as do most of the accessory sinuses, although in several instances the latter open into the infundibulum or the recessus bulbaris. The author found symmetric sinuses in most specimens.

Mangabeira-Albernaz [7] considers that in a true accessory sinus the cavity must have a separate duct leading into the nasal cavity. He cites 2 cases, in 1 of which the accessory cavity was posterior, whereas in the other it was lateral, to the true frontal sinus.

Abnormalities of the crista galli as a cause of headaches was the basis of an investigation by Borghesan.[8] He observed that the persistence of headache after cure of sinusitis was associated with roentgenographic evidence of an inflammatory process involving the crista galli, which in many instances was formed of diploic bone and occasionally even contained an air cell. The headaches were usually frontotemporal. In a series of observations, clinical, roentgenographic and anatomic, he found diploic cristae in 54 per cent and pneumatic cristae in 0.5 per cent of all cases. He believes that the close relation of this structure to the meninges and the frontal, ethmoid and sphenoid bones

6. Murai, Y.: Zur Kenntnis der sogenannten verdoppelten Stirnhöhlen, Sei-I-Kai M. J. (Abstr. Sect.) **56**:8 (Feb.) 1937.

7. Mangabeira-Albernaz, P.: Da duplicidade do seio frontal, Rev. oto-laring. de São Paulo **4**:459 (Sept.-Oct.) 1936; Sinus frontal double, Ann. d'oto-laryng., May 1937, p. 426.

8. Borghesan, E.: Anomalia dell'apofisi "crista galli" considerata quale probabile fattore di cefalea, Riv. oto-neuro-oftal. **13**:456 (Sept.-Oct.) 1936.

may explain how abnormalities, such as thickening of the bone, diploic structure and air cells might be the cause of persisting headaches. Several illustrative cases are cited.

Dixon's [9] study of the sphenoid sinus was based on examination of 1,600 skulls. In 7 per cent a large cylindric ridge on the internal surface of the sinus marked the location of the optic nerve. In no skull was the bony canal of the nerve completely free in the sinus, although in 9 cases the nerve was seven-tenths surrounded by pneumatic bone. In 46 specimens the carotid artery was one-half or more surrounded by bone projecting into the sinus. Dehiscences exposing the cavernous sinus and nerves were not common. The distance from the anterior nasal spine to the ostium varied from 56.71 to 57.64 mm. in females and from 60.93 to 60.60 mm. in males, the first figure being for white persons and the second for Negroes. The average diameter of the round ostia was 5.03 mm. and of the oval ostia 4.2 by 6.8 mm. For probing the ostium, the author advises passing the probe to the anterior surface of the sphenoid sinus where

> . . . the sense of touch will tell whether the anterior wall is perpendicular or sloping. If the wall faces downward or is perpendicular, the ostium faces forward, while if the surface slopes acutely backward, the ostium will face the cribriform plate. After ascertaining the slope of the anterior wall, the probe is bent laterally to the curve of the middle turbinate and raised to the junction of the septum and the roof. If this roof seems abnormally low, then a posterior ethmoid cell should be thought of and the ostium will be not far below this cell, approximately 2.4 mm. from the septum. If the junction of the septal wall and the cribriform plate were high, then the center of the average ostium would be 8.25 mm. inferiorly and 4.92 mm. externally to the septal wall.

PATHOLOGY AND BACTERIOLOGY

Richter [10] states that while congenital factors influencing the development of the sinuses have been well worked out by Albrecht and Schwartz, exogenous factors are not so easy to demonstrate, because the tissues are not under observation during their development, only the end results being available for study. Since it is known that ozena is definitely associated with retarded development of the sinuses, the author reviewed the results of examination of 244 patients seen at the Erlanger Clinic from 1931 to 1933. As a result of roentgen studies of 52 patients, 27 were found to have small frontal sinuses. The 25 persons with normal frontal sinuses did not show signs of ozena until the age of 20, when the sinuses were already developed. Persons with congenital syphilis make possible the study of the effect

9. Dixon, F. W.: A Comparative Study of the Sphenoidal Sinus, Ann. Otol., Rhin. & Laryng. **46**:687 (Sept.) 1937.

10. Richter, H.: Ueber exogene Einflüsse auf die Entwicklung der Nasennebenhöhlen, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **143**:251, 1937.

of the disease on the development of the sinuses. In infants the condition is called coryza syphilitica neonatorum. The author's studies of serial sections of the sinuses of 24 fetuses and infants showed hyperplasia of the mucosa with a tendency to polypoid formation. The vascular supply was rich, and there was considerable round cell infiltration, especially about the small vessels. Ossification was found to be retarded, although the cartilaginous capsule was intact. Calcification was absent in areas, and osteoblasts were less numerous than in normal sinuses. The author feels that the mucosa in these sinuses possesses little pneumatizing drive and therefore that underdeveloped sinuses in later life can be definitely ascribed to the disease.

Histologic studies of the mucosa of the sinuses of 32 subjects dying of exanthematous typhus were made by Beresniak.[11] In 11 sinuses (8 patients) changes characteristic of typhus were found. These are hyperemic succulent mucosa and an accumulation of lymphoid elements around the dilated blood vessels, with the formation of nodules resembling exanthematous nodules. The author points out that since in most of these cases the involvement of the sinuses is not recognized during life, there is a great element of danger that the persons who recover may be carriers. It is therefore important that the sinuses be carefully examined before a patient is discharged from quarantine.

Griffiths[12] introduced dyes into the sinuses of cats and dogs and followed their course through the lymphatics to the submaxillary glands, the upper and middle cervical glands, the tonsils and the bronchial glands. To prevent contamination, the experiments were repeated after the tonsils were completely embedded in the pharynx by stitching over the loose folds of mucous membrane in front and behind the tonsils. The dyes were again recovered from the tonsils. The author contends that since the tonsils seem to act as filters for toxic products originating in the sinuses, it is a mistake to remove them from children who are suffering from "nasal catarrh" until the sinuses are examined and cleared of infection. Of a series of 5,000 children with involvement of the nose and throat, 385 were found to be suffering from sinus infection. Furthermore, sinusitis was more common in children without tonsils than in those with tonsils.

On the basis of histologic studies of 113 specimens of mucosa removed from 91 patients, Heerup and Kettel[13] conclude that Manasse's

11. Beresniak, I. D.: Modifications histo-pathologiques dans les sinus paranasaux au cours du typhus exanthématique, Rev. de laryng. **58**:916 (Sept.-Oct.) 1937.

12. Griffiths, I.: Function of the Tonsils and Their Relationship to the Etiology and Treatment of Nasal Catarrh, Lancet **2**:723 (Sept. 25) 1937.

13. Heerup, L., and Kettel, K.: Vergleichende histopathologische, bakteriologische und klinische Untersuchungen bei chronischer Kieferhöhlenentzündung, Acta oto-laryng. **25**:471, 1937.

classification of chronic maxillary sinusitis into three types is essentially correct. These are the edematous, the chronic glandular and the fibrotic type. They found no connection between bacterial findings and the type of histologic change encountered; however, they did observe a connection between the type and quantity of secretion and the histologic appearance. The greatest amount of purulent discharge was found to be associated with chronic granular mucosa. This is accounted for by the unusual thickness of the membrane and the marked increase of cellular infiltration in all its layers. The authors could find no direct association between the allergic state and the number of eosinophils in the mucosa. They conclude that eosinophils are scarce in acute conditions and are found in large numbers only in the strictly edematous states. Metaplasia of the cylindric epithelium into the squamous type was found in only 13 of the 113 specimens studied, which differs materially from Oppikofer's statistics, in which 41 per cent of the specimens showed such changes. The authors state that Manasse found no instances of true metaplasia.

Malgeri [14] cites a case of global aplastic myelosis with involvement of the antrum in a woman of 49. The spleen was removed, and roentgen irradiation was administered without avail. Examination of the blood showed 1,350,000 red blood cells and 600 white blood cells, with a hemoglobin content of 21 per cent, 30 per cent neutrophils, 6 per cent eosinophils, 52 per cent lymphocytes, 2 per cent basophils and 10 per cent monocytes. A Caldwell-Luc operation showed the antrum filled with pus and friable myxomatous masses, which were especially prolific in the region of the ethmoid sinus. Histologic examination disclosed masses of mononuclear planocellular types and a few mononuclear eosinophils infiltrating the tissues.

Szende and Muranyi [15] believe that a knowledge of the bacterial offender in cases of sinusitis is of great value in directing the therapy, particularly in cases of acute infection. Secretions withdrawn under aseptic precautions in 50 cases revealed mostly pneumococci and catarrhal diplococci in the cases of acute involvement. The pneumococcic secretion was pale yellow or greenish and flocculent in consistency. The diplococcic secretion was milky and cloudy. The pneumococcic infection in several of the cases yielded promptly to irrigation with a pneumococcus serum. Streptococci were recovered in 13 of 21 cases of chronic involvement, staphylococci in 1 and a mixed flora in 7. Radical

14. Malgeri, G.: Mielosi globale aplastica e complicazione al seno mascellare, Valsalva **13**:312 (July) 1937.

15. Szende, B., and Muranyi, L.: Bakteriologie der akuten und chronischen Kieferhöhlenentzündungen und ihre Bedeutung für Prognose und Therapie, Ztschr. f. Hals-, Nasen- u. Ohrenh. **40**:638, 1937.

operation was performed in 12 of these cases. The authors used irrigations of a polyvalent streptococcus and staphylococcus serum and also a solution of a silver preparation in a concentration of 1 : 10,000, with good results and no damage to the mucosa. Fusobacillary infections yielded to irrigation with rivanol (an acridine dye derivative) followed by the instillation of 5 cc. of a 2 per cent solution of acriflavine hydrochloride.

DIAGNOSIS

Le Mee and Bouchet [16] claim that displacement with iodized oil yields valuable information with regard to the ethmoid cells. It permits one to locate aberrant cells and exceptional prolongations which when infected give rise to unusual symptoms. It helps in making the diagnosis of serous sinusitis and allergic reactions in certain persons, and finally the procedure enables one to observe the rate of absorption and elimination from the sinuses. The authors illustrate the value of displacement by presenting roentgenograms of 3 patients; in each instance the usual flat roentgenograms failed to disclose the unusual conditions present. In 1 case iodized poppyseed oil showed a large cell in the region of the pterygoid bone which was responsible for typical neuralgia of the vidian nerve. In another case a cell was located in the orbital floor close to the infraorbital foramen, causing neuralgia of the facial nerve. In the third case a large mucocele was disclosed which caused marked nasal obstruction. The authors' studies showed the rate of absorption of the oil and its passage through the lymphatics down to the thoracic lymph glands. Because of reports of ill effects from the use of iodized oil the authors have given up using iodized poppyseed oil 40 per cent and are employing a 10 per cent concentration in cod liver oil. In some cases they found an oxide of colloidal thorium dioxide agreeable and nonirritating.

De Lima [17] accomplishes displacement with a thin iodized oil by placing the patient in the Parkinson position (lateral with head low) and having him attempt to inhale forcibly while the nostrils are closed with the thumb and the forefinger, thus creating a vacuum within the nasal chambers. Several cubic centimeters of oil is again instilled and the procedure repeated, the patient alternating forced inhalations with quiet exhalation through the mouth until the sinuses are filled. The author uses up to 10 cc. of fluid and claims that this procedure is simple,

16. Le Mee, J., and Bouchet, M.: De la valeur diagnostique des radiopaques dans l'étude des ethmoïdites et des sinusites sereuses, Ztschr. f. Hals-, Nasen- u. Ohrenh. **40**:587, 1937.

17. de Lima, E.: Nota prévia sobre uma technica de enchimento dos seios para-nasaes pelo deslocamento, Brasil-med. **51**:850 (Aug. 14) 1937.

adequate and easily carried out. Several roentgenograms show the sinuses well filled.

Tomography as an aid in diagnosis of infections of the deeper sinuses is extolled by Liveriero [18] and Camino.[19] It is a procedure whereby any section of the body can be studied roentgenographically without reference to the overlying or the underlying tissues. The pictures are taken by an apparatus consisting of the tube and Bucky diaphragm locked in a mechanism that rotates before the object being photographed in such a manner that the central ray passes to it at the same distance but from different angles. Since only the object in focus will always stay in focus while the superimposed and underlying tissues are out of focus, the former will show up clearly, whereas the latter will appear blurred. For example, the sphenoid sinus may be clearly shown in its entire width without the other structures obscuring it. Liveriero's article gives the technical details of the procedure, while in Camino's article there are several excellent illustrations of what the procedure can accomplish. Camino states that his time of exposure is two minutes with from 85 to 90 kilowatts and from 120 to 140 milliamperes.

Arcelin [20] believes that irregularities in the shape and size of the foramen rotundum are the cause of neuralgia of the supramaxillary nerve and advises roentgenographic study of this structure. The foramen is located on the lateral aspect of the body of the sphenoid bone below the sphenoid fissure, from which it is separated by an osseous bridge of varying thickness. There is a gutter of variable depth in the lateral portion of the sphenoid bone which runs from the posterior surface forward, ending at the foramen, which faces the sphenomaxillary space. Measurements by the author showed the axis of the foramen to be at an angle of 10 degrees to the sagittal plane and at an angle of 15 degrees to the plane of the base. The difference between these two angles is what makes it difficult to get a good roentgenographic projection showing the true axis of the foramen. The author uses the nasion-inion line for his base line in figuring the angles. Several illustrations taken posteroanteriorly show the foramen through the orbit with the principal ray in line with the groove of the foramen, so as to show its maximal width.

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18. Liveriero, E.: Tomografia nel campo dell'otorinolaringologia, Valsalva **13**:305 (July) 1937.

19. Camino, M.: Tomographie des sinus crâniens, Bull. et mém. Soc. de radiol. méd. de France **25**:469 (June) 1937.

20. Arcelin, F.: L'exploration radiographique du trou grand rond, Lyon méd. **160**:267 (Sept. 12) 1937.

Kornblum [21] discusses the difficulties in interpreting roentgenograms of the sinuses because of varying technics and diverging opinions. He suggests that each hospital have one rhinologist go over every film with the roentgenologist, taking into consideration the clinical history and local findings, and report their joint interpretation at stated intervals.

Watson-Williams [22] presents a series of illustrations showing methods of introducing cannulas into the antrum and the posterior ethmoid and sphenoid sinuses. For the antrum he has two differently curved puncture trocars for use in the middle and inferior meatuses. He points out the difference between sounding a posterior ethmoid sinus and the sphenoid sinus and shows the relation of these sinuses to adjacent structures. He also stresses the importance of the nasopharyngoscope and presents an illustration of the type made by Mayer, of London. The illustrations make the article graphic and emphasize the fundamentals of instrumental aid in diagnosis.

Matsuda [23] credits Watson-Williams with the trocar and cannula which he has found useful in puncturing the sphenoid sinus. He uses a straight cannula 9.2 cm. long and 1.2 mm. in diameter, with an outer tube about 0.7 cm. shorter. It has two mandrins, a sharp one as long as the cannula and a dull one, which is 2 cm. longer. He prefers the sharp one. The author finds by study of cadavers as well as of living patients that the trocar can be safely inserted if it crosses the middle turbinate along the posterior third of the lower border.

Hondelink [24] has found Mittermaier's method of instilling a barium preparation into the antrum most successful in the diagnosis of tumors and abnormalities of the interior of the sinus. He reports 3 cases. In 1 the roentgenogram showed a fold of mucosa running from the floor to the roof, which at operation was proved to contain a nerve which had been the cause of severe pains. In several other cases the diagnosis of polyposis and hyperplasia was proved at operation.

ORBITAL AND OCULAR COMPLICATIONS

In a report of a symposium on orbital cellulitis before the Royal Society of Medicine, Davis [25] says that in 39 of 54 cases (72 per cent)

21. Kornblum, K.: A Roentgenologist Looks at Sinus Disease, Am. J. Roentgenol. **38**:48 (July) 1937.

22. Watson-Williams, P.: Tecnica personale di esplorazione dei seni paranasali, Arch. ital. de otol. **49**:80 (Feb.) 1937.

23. Matsuda, E.: Ueber die Probepunktion der Keilbeinhöhle und deren diagnostische Bedeutung, Oto-rhino-laryng. **10**:923 (Oct.) 1937.

24. Hondelink, H.: Das Laktobaryt zur Reliefdarstellung von umschreibenen Veränderungen an der Schleimhaut der Kieferhöhlen, Hals-, Nasen- u. Ohrenarzt (Teil 1) **28**:34 (Feb.) 1937.

25. Discussion on Orbital Cellulitis Due to Sinus Infection and Its Treatment, Proc. Roy. Soc. Med. **30**:1397 (Sept.) 1937.

reviewed by him the condition was due to suppuration of a sinus. In his experience the frontal sinus is the most frequent offender in adults and the ethmoid sinus in children. In 37 of the 39 cases cited an external incision was made and intranasal drainage instituted. One patient recovered spontaneously, while another died as a result of meningitis which was present prior to operation. Mygind [25] reviews 121 cases of orbital cellulitis and states that for the period from 1906 to 1920 77 per cent were found to be due to sinus infection, while from 1923 to 1937 the percentage reached 81. Since in many cases it is difficult to differentiate between simple edema and an abscess, he advises conservative treatment until one can be certain of the diagnosis. Only the presence of alarming symptoms should lead to early operation. Howells [25] also advises conservatism. Capps [25] states that proptosis indicates cellulitis and defines the manner of examination by which one may determine even a slight difference between the two eyes. If the diagnosis is in doubt, he always makes an incision, and he prefers the ophthalmologist's simple incision, leaving the periosteum alone. Watson-Williams [25] points out the distinction between periorbital abscess and cellulitis of the intraorbital tissues. The latter is less frequent in his experience and carries greater danger to the vision. In cases of periorbital abscess the eye is pushed outward and downward and ocular movements are less disturbed than in cases of true orbital cellulitis, in which the chemosis is marked and the eye is pushed forward.

Schreyer [26] reports 19 cases of orbital complications, in 15 of which they followed acute infections. He finds that trauma and early operation often lead to such complications. In 1 case they were due to the use of massage and light baths; in another, they followed extraction of a tooth. He cautions against early puncture of the antrum in cases of acute involvement and cites 3 cases from Breslau in which severe pyemia followed this procedure. Aside from the cases in which the complications were chronic or were due to trauma, the average time from the onset of acute infection to the appearance of orbital symptoms was from ten to fourteen days. The ethmoid sinus was involved in all of his cases, the maxillary sinus in 12 and the frontal sinus in 9. The author refers to Leroux's article on the importance of chronic infection of the ethmoid sinus in children as a cause of chronic disease of the lungs, gastrointestinal tract and recurring colds. Ten children, despite a history of normal sinuses, showed evidence of chronic infection of the ethmoid and maxillary sinuses. Such infections are easily lighted up by a fresh cold and may readily lead to an orbital

26. Schreyer, W.: Ueber orbitale komplikationen bei Nasennebenhöhlentzündungen, Ztschr. f. Hals-, Nasen- u. Ohrenh. **41**:432, 1937.

complication. Schreyer favors conservative treatment as far as possible, barring the presence of intracranial complications. However, none of the adults in his series was cured by treatment by the endonasal route alone. The external operation was performed for drainage, and the diseased sinus was cleaned out intranasally when the acute symptoms had subsided, in 1 case as late as eighteen days after the external incision. His intranasal procedure is to infract the middle turbinate with a Killian speculum and then to push the speculum directly into the mass in the ethmoid sinus so as to open it bluntly for drainage.

Gault, Grimaud and Blum [27] report 2 cases which exemplify the difference between a deep orbital cellulitis and a periorbital phlegmon. In the case of deep orbital cellulitis the symptoms were mild and responded promptly to conservative measures, yet the patient lost his vision. In the case of periorbital phlegmon there was a large abscess along the internal wall, extending far back, which gave rise to marked general symptoms; the patient recovered, with no loss of vision.

Rendu and Rollet [28] also try to bring out the difference between these two conditions. True orbital cellulitis is characterized by fixation of the eyeball, exophthalmos and marked palpebral edema and is a definite indication for early incision. The evolution of suppuration is marked by an increase in the general symptoms and the appearance of corneal anesthesia and dilatation of the pupil.

Sargnon and Paufique [29] present the results of a clinical study along the lines of the articles just mentioned and call attention to the comparatively benign superficial palpebral infections as contrasted to the more serious deep cellulitis. The former is more frequent in children and yields to physical therapy plus simple incision if pus is present.

Hubert's [30] article is based on a study of 114 cases of orbital infections, which were divided into five groups. The first group consisted of 31 cases of simple edema of the lids with or without edema of the orbit. Conservative measures were successful in 20; an incision was made in 1 case without pus being found; a middle turbinate was removed in 1 case, and external operation was performed in 9. Five of the patients died, 1 of meningitis and 4 of abscess of the brain. The second group consisted of 46 cases of subperiosteal abscess, in 37 of which the lids were involved. All the patients recovered after

27. Gault, Grimaud and Blum: Phlegmons de l'orbite d'origine sinusienne, suivis de guérison, Bull. Soc. d'opht. de Paris, April 1937, p. 271.

28. Rendu, R., and Rollet, J.: Fluxion orbitaire avec exophtalmie au cours d'une fronto-ethmoïdite de l'enfance, Lyon méd. **159**:168 (Feb. 7) 1937.

29. Sargnon and Paufique: Le flussioni orbitarie di origine naso-sinusale, Valsalva **13**:337 (July) 1937.

30. Hubert, L.: Orbital Infections Due to Nasal Sinusitis, New York State J. Med. **37**:1559 (Sept. 15) 1937.

operation. The third group was made up of 22 cases of orbital abscess. Two of the patients died of meningitis and 1 of abscess of the brain. Nine cases of orbital cellulitis with phlebitis and sepsis, composed the fourth group. Six of the patients in this group died of meningitis. The fifth group consisted of 2 cases of thrombosis of the cavernous sinus, both of which proved fatal. Conservative treatment was employed in the first group, except in the cases of acute fulminating sinusitis in which external operation has always yielded poor results. Good results were obtained in the second group with simple incision and drainage. In the third group the orbit was exposed, and if the bone and fascia were intact, an incision was made into the orbital fascia and drainage instituted. In the fourth group of cases, those in which the infection spread via the venous channels, the orbital fascia was opened widely and at the same time the offending sinus was opened so as to decompress the orbital contents and relieve the pressure on the optic nerve.

Chavira [31] does not believe that oculo-orbital complications are as frequent as claimed by some. In some cases the connection between the sinus infection and the orbital complication is clear and in others it is obscure. Several interesting cases are cited. In 1 instance a patient had swelling of the internal angle of the orbit for several months without inflammatory signs affecting the eye; yet at operation an indolent abscess was found, with erosion of the roof of the orbit and exposure of the dura. In another case, that of a child with primary maxillary sinusitis, some painful teeth were extracted, resulting in infection of the cheek and extension from the antrum to the ethmoid and frontal sinuses, with such orbital symptoms as exophthalmos and restricted ocular movements. The abscess ruptured spontaneously at the internal angle, and at operation the floor of the frontal sinus was found to be eroded. In case 3 a rapidly progressing optic neuritis was found to be due to infection of the sphenoid sinus and was cured by removal of the middle turbinate and opening of the sinus. In case 5 a mucocele of the frontal sinus was found associated with Rollet's sign, namely, hyperostosis of the floor of the frontal sinus and the junction with the nasal bones. The growth consisted of a compact mass of solid bone at the root of the nose, which was easily demonstrated roentgenographically.

Lopes [32] gives an extensive review of the whole subject of orbital and ocular complications, including a consideration of the topical

31. Chavira, R. A.: Complicaciones oculares en algunas sinusitis, Rev. mex. de cir., ginac. y cáncer **5**:231 (May) 1937; An. Soc. mex. de oftal. y oto-rino-laring. **11**:283 (April-June) 1937.

32. Lopes, O.: Complicacoes oculo-orbitarias da sinusite maxilar, Rev. oto-laring. de São Paulo **4**:1075 (Nov.-Dec.) 1936.

anatomy of the structures involved, and quotes from Le Maitre's book on the classification of oculo-orbital complications originating from infection of the sinuses. Eleven cases are reported, including cases of iritis, amblyopia, retrobulbar neuritis, orbital cellulitis and orbital thrombophlebitis. While the complications in most of the cases were attributed to infection of the maxillary sinus, the histories indicate involvement of other sinuses as well. Only in a few of the non-suppurative complications could the maxillary sinus be definitely blamed for the complication.

Genet and Mounier-Kuhn [33] state that some orbital abscesses have a close resemblance to genuine tumors of the orbit. They report 10 such cases. Since ocular symptoms overshadow the nasal symptoms, the connection may be lost sight of. Usually the process begins with ocular pains followed by exophthalmos and swelling of the lids. Palpation may differentiate the condition from tumor, which is more dense and less inflammatory. There may be dilatation of the pupil, swelling of the retinal veins, impairment of the fields and loss of vision. Roentgen studies are of paramount importance in the diagnosis and location of the focus in the sinus. The authors favor adequate intranasal drainage and avoid external operation whenever possible.

Retrobulbar neuritis is thoroughly discussed by Sourdille,[34] who operated on 25 patients with signal success. After an extensive study of the anatomic and histologic data, he concludes that retrobulbar neuritis is in most cases due to infection of the opticochiasmic meningeal spaces, which become involved by extension from the posterior sinuses. He claims to have proved a direct connection between the two areas and demonstrates it in several graphic drawings. When there is a history of a recent nasal infection immediately preceding the onset of a retrobulbar neuritis, he urges early operation despite the absence of local evidence of sinusitis. Bilateral scotomas, frontal or occipital headaches and papillary edema should be enough to warrant opening the sinuses. The author insists on the nonspecific nature of the procedure and goes on the assumption that even the presence of a definite etiologic factor, such as multiple sclerosis, encephalitis or syphilis, is no contraindication to the operation provided the medical treatment has been tried and found unsuccessful. He claims that under normal conditions the optic nerves can successfully defend themselves against infection, but if the anatomic conditions are abnormal, such abnormalities must be corrected before the nerve will respond to treatment.

33. Genet, L., and Mounier-Kuhn, P.: Les pseudo-tumeurs de l'orbite par dilatation des sinus de la face, Ann. d'oto-laryng., April 1937, p. 327.

34. Sourdille, G. P.: Lésions anatomiques endocraniennes dans la névrite rétrobulbaire, Arch. d'opht. **1**:3 (Jan.) 1937.

Segura [35] is practically in agreement with Sourdille on this subject and states that in his experience the anatomic conditions predisposing to optic neuritis are mainly a large sphenoid sinus and an optic nerve the bony canal of which partly traverses the sinus. Roentgenograms have proved this juxtaposition many times to his complete satisfaction. He has had excellent results from an operation which he does not hesitate to undertake in all cases in which the cause is obscure or medical treatment fails to yield prompt relief. He does not find it necessary to open the posterior ethmoid sinuses but confines his surgical treatment to the endoseptal approach to the sphenoid sinuses, both of which are opened widely. The lining is not removed unless palpably diseased. The author states that even a positive Wassermann reaction or the presence of tabes is no contraindication to the operation, since his experience has proved that the condition in many of these cases fails to respond to the therapy until the sphenoid sinuses are opened.

Escat [36] is another who holds the same views as those just mentioned. Since his article on this subject in 1928 recommending early ablation of the middle turbinate and opening of the sphenoid sinus, he has operated in 29 cases, with cure in 21. He still upholds the practicability of the procedure regardless of whether the Wassermann reaction is positive or not. The operation does not interfere with antisyphilitic treatment and yields a high percentage of early cures irrespective of the presence or absence of a gross pathologic process. He is of the opinion that recovery is due in large measure to the relief of the sympathicotrigeminal reflex, as described by Caneghem and Sargnon.

Giacobbi,[37] like Sargnon, has found optic neuritis in association with extensively pneumatized sphenoid sinuses and reports 3 cases in which operation yielded prompt recovery despite the absence of a gross pathologic process. He also believes in the theory of a reflex nervous mechanism as an etiologic factor.

Kafka [38] presents a statistical survey of records from New York University College of Medicine and the Bellevue Hospital with reference to oculo-orbital complications. In 10 cases of retrobulbar neuritis a definite pathologic process was demonstrated in one or more of the

35. Segura, E. V.: Les nevrites retro-bulbaires, Ztschr. f. Hals-, Nasen- u. Ohrenh. **40**:594, 1937.

36. Escat, E.: Action résolutive sur certaines névrites optiques exclusives de toute propathie nasale ou naso-sinusale de l'éxérèse du cornet moyen normal et de la trépanation endonasale du sinus sphénoïdal correspondant: Derniers résultats, Ann. d'oto-laryng., February 1937, p. 93.

37. Giacobbi, L.: Sui rapporti tra abnorme pneumatizzazione dei seni sfenoidali e neurite ottica, Riv. oto-neuro-oftal. **14**:317 (May-June) 1937.

38. Kafka, M. M.: The Relationship of Sinus Diseases to the Diseases of the Eye with Review of Fifty-Two Cases, Laryngoscope **47**:272 (April) 1937.

sinuses. The condition in 6 cases was unimproved because of lack of cooperation on the part of the patients.

As to other ocular complications, the most important contribution is Gill's report [39] amplifying his previous paper [40] on the subject of the relation of uveitis to sinus disease. He presents the results of study of a group of 230 patients, including the group previously observed. "The type of uveitis with which we are concerned in the article is the insidious, low grade, essentially chronic type of inflammatory reaction involving the vascular structures posterior to the iris in which the principal etiological factor is regarded by many authorities to be one or more chronic foci of infection." Infection of the paranasal sinuses was present in 40.8 per cent of his patients, the ethmoid sinuses being involved in more than half of them. His diagnostic methods included the removal of tissue and the demonstration of the presence of a rarefying or condensing osteitis involving the walls of the ethmoid and sphenoid sinuses. Also, in most of the cases there was definite hypertrophy of the mucous membrane. Twenty-eight patients were subjected to intracutaneous uveal pigment test, and the responses varied from mild erythema to severe reactions, with vesicle formation and ulceration. Treatment of the sinus must be thorough in order to avoid residual infection, which may prolong the trouble.

Posarelli [41] proposes the term "dacryosinusitis" for an infection of the lacrimal sac secondary to disease of the sinuses and presents a mass of clinical, roentgenographic and histologic evidence to prove that such a sequence is not only frequent but plausible. He finds that the venous channels are the most common pathways of the spreading infection, although in some cases it passes from the sinuses to the lacrimal sac by direct contiguity of tissue.

A case of infective keratitis in which the infection was resistant to treatment is reported by de Cerqueira Falcão; [42] prompt recovery followed a bilateral Caldwell-Luc operation. The author refers to some excellent reports on the same subject by Professor Moraes, of Bahia.

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39. Gill, W. D.: The Clinical Relationship of Infections in the Upper Respiratory Tract to Certain Types of Chronic Posterior Uveitis: Supplementary Report, Ann. Otol., Rhin. & Laryng. **46**:643 (Sept.) 1937.

40. Gill, W. D.: The Clinical Relationship of Infections in the Upper Respiratory Tract to Certain Types of Chronic Uveitis: Preliminary Report, Ann. Otol., Rhin. & Laryng. **44**:486 (June) 1935.

41. Posarelli, A.: Sulla dacrio-etmoidite, Riv. oto-neuro-oftal. **13**:555 (Nov.-Dec.) 1936.

42. de Cerqueira Falcão, E.: Corneal Ulcers Due to Sinusitis, Brasil-med. **51**: 341 (March 6) 1937.

Pressman [43] reports an interesting case of iritis in which no focus of infection could be found except a suspicious clouding of the right (contralateral) sphenoid sinus. The sinus was opened through its anterior wall under the infracted middle turbinate, with temporary relief. Recurrence of the iritis and the fact that the irrigating fluid escaped from the side opposite the sinus operated on led to roentgenographic examination with a probe in place. This disclosed that although the operation was done on the right side, in reality it was the left sphenoid sinus which had been opened since it was so large that it extended beyond the midline, encroaching on the space normally occupied by the right sphenoid sinus. Subsequent probing located the opening of the right sphenoid sinus high up in the extreme sphenoethmoid recess. Adequate treatment was followed by recovery.

Hatschek [44] reports a case in which sarcoma originated in the sphenoid bone and invaded the orbit, causing exophthalmos. The latter was the only symptom present for a long time, and the author stresses the importance of careful and frequent roentgenographic studies to differentiate a primary retro-orbital tumor from a secondary growth. In this case, as in others heretofore reported, the symptoms of intracranial pressure are absent until late in the process.

INTRACRANIAL COMPLICATIONS

Neal, Jackson and Appelbaum [45] divide the treatment of septic meningitis into surgical, serologic and chemical.

Their surgical treatment consists of elimination of the original focus and repeated spinal puncture. They find the latter just as efficient for drainage as laminectomy or cisternal puncture. Forced drainage (Kubie) has not proved satisfactory and has been abandoned.

Their results with serologic treatment have not been good except in cases of meningococcic meningitis. In cases of pneumococcic meningitis serologic treatment has been a failure, but in some cases of streptococcic meningitis they have obtained good results, particularly in cases of scarlet fever.

The authors have given up the use of various dyes in chemical treatment. Ethylhydrocupreine hydrochloride is still found to be useful in the treatment of pneumococcic infections. They do not favor the intra-

43. Pressman, J. J.: Iritis Caused by Asymptomatic Sphenoiditis with Anomaly of the Sphenoid Sinus, Arch. Otolaryng. **26**:83 (July) 1937.

44. Hatschek, G.: Ein Beitrag zur Diagnose und Pathologie intrakranieller Tumoren im Bereich des Keilbeinflügels mit Durchbruch in die Augenhöhle, Folia ophth. orient. **2**:328, 1936.

45. Neal, J. B.; Jackson, H. W., and Appelbaum, E.: A Summary of Methods Used in Treating Meningitis Secondary to Infections of the Ears and Sinuses, Laryngoscope **47**:317 (May) 1937.

carotid route for the injections. They have had excellent results with sulfanilamide, especially in cases of meningitis due to the hemolytic streptococcus. They find no advantage in intraspinal injections and recommend the combined oral and intramuscular administration of moderate doses, such as from 5 to 10 cc. of prontosil (the disodium salt of 4-sulfamidophenyl-2′-azo-7′-acetylamino-1′-hydroxynaphthalene-3′-6′-disulfonic acid) every four hours and from 5 to 15 grains (0.32 to 0.97 Gm.) of sulfanilamide every six hours. For children, they follow the routine recommended by Bliss and Long, namely, the administration of 1 cc. of prontosil per pound of body weight per twenty-four hours.

Worms [46] is impressed with the frequency of meningeal symptoms occurring in the course of and as a result of sinus disease and reports several pertinent cases. These are cases in which meningeal symptoms, such as headache, Kernig's sign, stiff neck, increased spinal fluid pressure, pleocytosis and impaired vision, are all present but bacteria are absent. Often epileptiform seizures and psychic disturbances occur. He believes that the symptoms are due to transmission of toxins via the lymphatics or the olfactory filaments from the nasal passages to the meninges, causing stasis of the increased cerebrospinal fluid. In some of his cases the sinus disease was not openly manifest but careful examination plus roentgenographic studies revealed the pathologic process, eradication of which was followed promptly by a cessation of the meningeal symptoms.

As a result of histologic and postmortem studies, Balzano [47] claims to have demonstrated the passage of infection from the sphenoid sinus to the optic chiasm and to the meninges by way of the nerve sheath and communicating veins. He found that the chronic hypertrophic type of sphenoiditis with polypoid-papillary thickening was particularly likely to lead to spread of infection beyond the sinus. In his opinion it is due to blocking of the ostium and stagnation of infective secretions, and in such cases he has shown that the infection is carried to the meninges by way of the lymphatics.

Grimaud and Blum [48] present a problem in diagnosis. A man 65 years of age was seen in stupor, but no antecedent history was available. A fistula discharging pus was present in the inner third of each upper lid, leading directly to the bone; there was slight chemosis but little inflammatory reaction; the fundi were normal, and pus was present in both middle meatuses. Since there was no evidence of uremia or

46. Worms, G.: Etats méningés d'origine rhino-sinusienne, Paris méd. **2**:250 (Oct. 2) 1937.

47. Balzano, I.: Sinusite sfenoidale e diffusioni flogistiche periottiche e meningee, Oto-rino-laring. ital. **7**:351 (Aug.) 1937.

48. Grimaud, R., and Blum, A.: Méningite consécutive à une pansinusite, Rev. méd. de Nancy **65**:126 (Feb.) 1937.

diabetes, the symptoms seemed to point to cerebral infection. The absence of meningeal symptoms, the presence of stupor, the indolence of the local lesions and the slight degree of fever seemed to point to gumma with cerebral extension, and pending the outcome of the Wassermann test active treatment with mercuric cyanide was instituted. There was slight improvement, and two days later roentgenograms were taken. The next day the patient died, and autopsy disclosed osteoporosis of the skull, leptomeningitis, abscess of the frontal lobe, necrosis of the sphenoid bone and thrombosis of the cavernous sinus; also pansinusitis with invasion of the orbit. The author was amazed at the extent of the pathologic process in view of the paucity of symptoms elicited and defends his original diagnosis on the basis of the indolence of the lesions in the usual site of predilection for gummas. He attributes the absence of meningeal symptoms to the walling off of the infection in the silent frontal area. (One wonders why the intranasal findings were ignored and why there was so much delay in obtaining roentgenograms. Also, abscess of the frontal lobe would have been a much better guess in view of the general ensemble.)

Kramer [49] lists sources of infection of the endocranium as follows: (1) osteitis of intervening bone; (2) osteomyelitis; (3) phlebitis, and possibly a combination of these three conditions; (4) direct spread of infection through dural and neural polypi, (5) infection through a defect in the cranial wall of the sinus and (6) infection through perivascular lymph spaces.

In addition, there is clinical evidence but no microscopic proof of the following sources of infection: (1) orbital infection from sinusitis with subsequent spread by way of vessels or directly through the orbital fissure; (2) involvement of the pterygomaxillary fossa and extension through foramens or by way of the veins, (3) extension by way of the pterygomaxillary space through osteomyelitis of the inferior maxilla, then through the orbit or by way of the vessels and (4) metastases from distant foci.

Becco [50] reports a case of abscess of the frontal lobe in a boy of 17 following acute rhinitis with swelling and tenderness of the supraorbital region and subsequent recovery. Roentgenograms showed blurring of the upper margin of the frontal sinus. Operation disclosed pus and granulations and a communication with the opposite sinus, which was also involved. After a few days headache, vomiting, slow pulse and prostration appeared. The spinal fluid was under pressure.

49. Kramer, R.: The Pathways of Infection from the Paranasal Sinuses, Laryngoscope **47**:304 (May) 1937.

50. Becco, R.: Absceso del lóbulo frontal de origen sinusal, Rev. Asoc. méd. argent. **50**:219 (Feb.) 1937.

Reoperation disclosed an area of osteitis of the posterior wall of the frontal sinus. The dura was under tension. Puncture revealed pus, and about 10 cc. was evacuated; drainage was effected by means of a rubber tube. The offending organism was a "diplostreptococcus."

Howarth [51] reports 2 cases of abscess of the frontal lobe. In 1 the abscess was opened and drained six months after an attack of frontal sinusitis with an external fistula. A cerebral hernia followed, which subsided gradually. The patient was free from symptoms for four months, when he suffered sudden loss of consciousness for two days with spontaneous recovery. He remained well for five years, although the vision was poor. During this period there were several attacks of loss of consciousness, and a ventriculogram showed dilatation of the ventricles, especially of the anterior horn on the affected side. At operation the ventricle was found adherent by a heavy scar to the frontal sinus and roof of the orbit. The adhesions were liberated, freeing the frontal lobe. However, the attacks persisted at the rate of from 20 to 30 a year for four years up to the time the case was reported.

In the other case, in which the symptoms were of long standing and there was a history of repeated attacks of frontal sinusitis, an abscess of the frontal lobe, located near the external angle of the orbit, was evacuated. The culture showed Streptococcus haemolyticus. The patient remained well for two and a half years and then suffered a sudden attack of jacksonian spasms, vomiting and headache. All of the cranial nerves were normal. The spinal fluid was clear and not under tension. Exploratory operation was done through the frontoparietal region, with removal of a large area of bone. The dura was normal, and puncture gave negative results. The patient has since had several attacks and has been under observation for eight years.

Additional cases in which there was a recurrence of symptoms after apparent cure of an abscess of the frontal lobe are reported by Just [52] and by Arauz and del Sel.[53] In the case reported by the former author symptoms such as headache, vomiting and convulsions made their appearance six months and again twelve months after the original drainage of the frontal lobe. Operation through the scarred area revealed a cystic formation, evacuation of which gave temporary relief the first time and more permanent relief the second time (seven years). Just's review of the literature on this subject reveals a consensus that the recurrence of symptoms in most cases is due to scar formation or to

51. Howarth, W.: Abces latent du lobe frontal, Ann. d'oto-laryng., June 1937, p. 513.

52. Just, B.: Geheilter rhinogener Stirnhirnabscess mit erneutem Aufreten von Hirnerscheinungen, Ztschr. f. Hals-, Nasen- u. Ohrenh. **42**:199, 1937.

53. Arauz, S. L., and del Sel, J. A.: Absceso cerebral frontal. Post-sinusal. Operación. Curación. Recidiva, Rev. Asoc. méd. argent. **[50]**:1890 (Nov.) 1936.

the development of a cyst. In the case reported by Arauz and del Sel the symptoms recurred two months after the abscess had been drained and included ataxia, euphoria and sudden coma. Operation disclosed a large deep-seated abscess of the frontal lobe yielding a foul green pus. Drainage was effected through glass tubing, which was later replaced with gauze treated with bismuth tribromphenate. The authors were impressed by the symptom of definite frontal ataxia as well as the anosmia and mental confusion.

A case of extradural abscess of long standing is reported by Rosenfield.[54] A man of 75 had had an abscess above the left eye evacuated two years previously, having refused to undergo an extensive operation, which had been advised. The wound discharged continuously, and he suffered from recurring headaches. Eventually he submitted to a more extensive operation, which disclosed erosion of the posterior plate exposing the dura over an area of about 4 square centimeters. The dura was covered with granulations and was adherent to the margins of the defect. Several small sequestrums were removed. The nasofrontal duct was blocked by fibrous tissue. Recovery ensued, with marked deformity, which, on account of the patient's advanced age, was permitted to remain uncorrected. The sinus was evidently obliterated by the operation.

An unusual case of abscess of the frontal lobe complicating acute sphenoiditis is reported by Kaplan.[55] With the development of cerebral symptoms, abscess of the brain was suspected, and the diagnosis was confirmed by ventriculographic examination. The abscess was approached via a large frontal flap, and drainage was effected with the Mosher drain until it extruded by herniation. The author points out the symptoms which should suggest this complication in the presence of sphenoiditis: (1) "infection of the upper respiratory tract followed some time later by frontal headaches associated with intermittent pains in one eyeball and transitory sensory disturbances of the trigeminal nerve on the same side, (2) headaches referred to the torcular, accompanied by some stiffness of the neck, (3) early papilledema, particularly fulness and tortuosity of the retinal veins, (4) slight facial weakness on the contralateral side and (5) a generalized or focal convulsion." Kaplan believes with Turner, Reynolds and Druss that the pathway of infection is by way of direct necrosis of intervening bone, although vascular pathways and dehiscences may also be contributing factors.

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54. Rosenfield, C. L.: Frontal Sinus Suppuration with Extradural Abscess of Approximately Twelve Months' Duration, M. J. Australia **1**:293 (Feb. 20) 1937.

55. Kaplan, A.: Recovery from Abscess of the Frontal Lobe Secondary to Empyema of the Sphenoid Sinus, Arch. Otolaryng. **25**:66 (Jan.) 1937.

Blondiau and Demanez [56] report a case of acute fulminating frontal sinusitis that developed a few hours after diving, with chills, high fever, severe pain and swelling of the lids. Roentgen examination showed a large frontal sinus with an extensive temporal recess. A few days later, the redness and swelling having extended to the parietal region, a diagnosis of erysipelas was made. Proptosis soon appeared, and the vision and pupillary reflexes were diminished. This was followed by meningeal symptoms, including cloudy spinal fluid containing 2,000 cells and pneumococci on smear. The patient would not give permission for an external operation. Intranasal drainage was instituted by resection of the middle turbinate and opening the ethmoid cells. The condition became progressively worse, and a diagnosis of abscess of the frontal lobe or of orbital abscess was considered. The patient was treated by daily lumbar puncture, with daily intravenous injections of carbon. A swelling soon appeared in the temporal region, with marked trismus, and an abscess was opened at the superoexternal angle of the orbit. Later, another abscess ruptured spontaneously through the upper lid. The patient was given injections of autovaccine and began to improve. A third abscess was evacuated directly in front of the ear. Roentgenograms revealed involvement of the frontal and maxillary sinuses. The latter was irrigated several times. A few months later an external radical operation was performed; a sequestrum measuring 4 by 3 cm. was removed as well as another sequestrum from the external angle of the orbit, which explains the spread of the infection to the temporomaxillary fossa. The exposed dura was covered with granulations. The report is unusually instructive and the recovery of the patient a tribute to the patience and conservatism of the surgeons.

SINUSITIS IN CHILDREN

Dean [57] believes that allergy predisposes the sinuses to infection by reason of the stasis and blockage it produces. The sinusitis may be due to a true allergy with sensitivity to various agents or to a vasomotor disturbance caused by dietary or endocrine imbalance. The history and examination must be thorough in order to determine the true etiologic factor and the corresponding therapeutic measures employed. When all have failed, zinc ionization may be tried, although the procedure "does have deleterious effects on the mucous membrane." In the same symposium, Mitchell [57] states that poorly developed sinuses in children

56. Blondiau and Demanez: Sinusite frontale nécrosante compliquée; méningite à pneumocoques—guérison opératoire, Bull. Soc. belge d'otol., rhin., laryng., 1937, p. 138.

57. Round Table Discussion on Nasal Sinus Disease, J. Pediat. **10**:683 (May) 1937.

are due to the following factors: (1) heredity; (2) familial tendencies, including environment; (3) infection; (4) allergy, and (5) inadequate secretion of the ductless glands. Chronic sinusitis is not usually diagnosed unless sought for as the focal agent in conditions such as nephritis, pyelitis, nervous manifestations, rheumatism, fever, cough and enlargement of the bronchial glands. Chronic maxillary sinusitis may require a nasoantral window operation. Shea,[57] agreeing with Dean and Mitchell in the matter of diagnosis and general treatment, enlarges on the surgical aspect of the question. He opens the antrum in the inferior meatus with a trocar and enlarges the opening with Ritter sounds. The rubber drainage tube is kept open with oil and is removed on the fourth day. Irrigations are continued until the drainage ceases. Autogenous vaccines are given in series following the operation: one series in the fall, another during the winter and the third in the early spring. The long-continued use of ephedrine is condemned by all of the authors, as was the use of mild protein silver for any length of time. Shea prefers irrigations with saline solution and the use of the benzedrine inhaler for comfort. Whenever ephedrine is indicated, Dean advises a 0.5 per cent solution in saline solution, administered with the patient's head tipped far back.

Looper [58] relies on roentgen studies for the diagnosis of sinus disease in children. The nasopharyngoscope is helpful but often difficult to handle. In cases in which the diagnosis is obscure he recommends puncture of the antrum and bacteriologic study of the secretions.

Dushan [59] presents a complete résumé of the subject of sinusitis in children from the etiologic and diagnostic points of view. He seems to think that nasal discharge is apparently increased after removal of the tonsils and adenoids, because with the obstructions out of the way the secretions flow backward more readily, causing postnasal drippage and cough. He also observes that sinusitis is present in at least 50 per cent of children with otitis media.

Among the predisposing factors in the production of chronic sinusitis in children, Marks [60] mentions rickets as causing asymmetric development of the skull with correspondingly impaired development of the sinuses. He claims that chronic sinusitis is frequently found in the underdeveloped side of the head. In considering the diagnosis, the author describes the typical symptoms of recurrent colds, cough and loss of appetite despite recent removal of tonsils and adenoids and then gives the physical findings on which the diagnosis is based, viz., postnasal

58. Looper, E. A.: Infection of the Nasal Accessory Sinuses in Children, M. Clin. North America **21**:1323 (Sept.) 1937.

59. Dushan, S. S.: Paranasal Sinusitis, Arch. Pediat. **54**:643 (Nov.) 1937.

60. Marks, H. B.: Chronic Sinusitis in Children, New England J. Med. **216**: 604 (April 8) 1937.

discharge, red glairy pharyngeal walls, enlarged cervical glands, "sinus odor" on the breath and cloudiness in the roentgenograms. In regard to treatment, especial attention to constitutional factors is stressed. The author mentions the use of a suction bulb for relief of secretions in cases of acute involvement and the prevention of aural complications. He is opposed to the use of nasal drops and quotes Proetz and Lierle in this connection.

Lindsay's [61] article on chronic sinusitis is based on a review of 200 cases in children 13 years of age and under. The factors predisposing to chronicity are vitamin deficiency, endocrine imbalance, allergy, improper housing and climatic conditions; also physical and chemical factors, such as an overheated dry atmosphere and the indiscriminate use of nasal medicaments. The author feels that every person with a chronic cough, bronchitis, bronchiectasis and asthma should be subjected to a careful roentgen examination of the sinuses. When tonsils and adenoids are present, he advises simultaneous irrigation of the antrums while the child is under anesthesia. Weekly roentgenographic studies after an acute attack are useful in determining whether the sinuses have entirely cleared. Lindsay finds it possible to use a local anesthetic when irrigating the antrums of children over 6 years of age. If the child is uncooperative, he finds it advisable to make a window in the antrum. The middle turbinate is occasionally amputated to improve drainage. During the past three years the use of a stock vaccine sprayed into the nose "has apparently resulted in a very definite decrease in the number of acute infections of the upper respiratory tract."

Ebbs [62] reports that an analysis of the results of postmortem examinations on 200 children dying of pneumonia revealed infected sinuses in 42.5 per cent. The incidence of bronchiectasis was high in this group. The histories revealed numerous attacks of bronchitis or bronchopneumonia. Illustrative case reports accompanied by photomicrographs of sections from the lungs and extensive references to the literature make the article worthy of study. The author emphasizes the importance of early diagnosis of bronchiectasis and removal of coincident disease in the sinuses. Chronic bronchiectasis is hard to cure. The sinuses must be cleaned out and the patient sent away to a convalescent home in a favorable climate. In all of 15 cases of bronchiectasis in the series the author found coexistent infection of the sinuses or ears.

McArthur [63] claims that the usual objections to radical operation on the antrum of children, namely, danger to the permanent tooth buds

61. Lindsay, J. R.: Chronic Sinusitis in Children, Illinois M. J. **71**:323 (April) 1937.

62. Ebbs, J. H.: The Relation of Upper Respiratory Tract Infection to Early Bronchiectasis in Children, Proc. Roy. Soc. Med. **30**:1407 (Sept.) 1937.

63. McArthur, G. A. D.: The Results of Radical Antrum Operations in Children, M. J. Australia **2**:470 (Sept. 18) 1937.

and unsatisfactory results with permanent invalidism, are not valid provided care is taken to make the opening sufficiently high and to avoid damage to the infraorbital nerve. Also, one must be careful not to traumatize the soft tissues with the retractors and to remove the mucous membrane of the sinus completely. The records show that 40 patients under the age of 10 were operated on prior to 1931, 20 of whom were subsequently traced. The results were good in 13, fair in 3 and poor in 4. One patient had bronchiectasis and was relieved by an operation on the ethmoid sinus. Another had a chronic cough; the antrum was reopened, and an area of infected mucosa was discovered which was isolated by a band of fibrous tissue. Removal brought about relief from the cough and discharge, although the headache persisted. In 15 of the series a full complement of upper teeth developed. One patient reported a cuspid tooth missing.

Morgan [64] likes the term "bronchosinusitis" applied by Watson-Williams to sinusitis associated with bronchitis and is in favor of early operation on the affected sinus.

Rathbone [65] treated 70 children suffering from chronic disease of the sinuses by roentgen irradiation and compared late roentgenograms with those taken before the treatment was started. He found 57 per cent of the children cured, 28 per cent improved and 15 per cent not benefited. He considers this treatment ideal for patients with diffuse lymphoid hyperplasia throughout the nose and throat, a watery or mucous discharge, a history of frequent colds, a chronic cough and hyperplasia of the mucosa of the antrum or ethmoid sinus, as demonstrated roentgenographically. He also recommends it for infants and young children with frequent colds, otitis media and enlarged glands who are too young for tonsillectomy. He feels that the treatment is perfectly safe and that it is an advantage to postpone tonsillectomy until the child is older. After roentgen treatment the adenoids shrink from 25 to 50 per cent. In one hospital Rathbone uses 125 kilovolts, 5 milliamperes, a distance of 12 inches (30 cm.) and a 5 mm. aluminum filter and gives 120 roentgens measured in air. At another hospital he uses 220 kilovolts, 20 milliamperes, a distance of 50 cm. and a 0.5 mm. copper filter and gives a dose of 100 roentgens. Three overlapping areas, 10 by 10 cm. or 7 by 7 cm., are treated, one anterior area and a right and a left lateral area, depending on the size of the child. The eyes and eyebrows are protected with 1 mm. lead shields, which are oval and of various sizes to fit the bony orbits. A small band of adhesive tape

64. Morgan, B.: The Relation of the Ear, Nose and Throat to the Diseases of Children, Proc. Roy. Soc. Med. **30**:1415 (Sept.) 1937.

65. Rathbone, R. R.: Roentgen Therapy of Chronic Sinusitis in Children, Am. J. Roentgenol. **38**:102 (July) 1937.

across the nose holds the shields in place. Routinely six treatments are given, three a week for two weeks, only one area a day being treated in rotation with 100 or 120 roentgens, depending on available equipment. If cough is present, the chest is given 100 roentgens at the end of the treatments of the sinuses.

SINUSITIS IN RELATION TO DISEASES OF OTHER ORGANS

Pulmonary Diseases.—Fox and Harned [66] present a résumé of their routine survey of asthmatic patients at the Illinois Research Hospital. The patients were admitted to the allergy department, where a complete physical examination was made. Laboratory tests included examination of the blood, urine and sputum, cutaneous tests, a determination of the basal metabolism, electrocardiographic study and roentgenographic study of the chest. The patients were then sent to the department of otolaryngology, where roentgenograms were made after the injection of contrast mediums and cultures and smears were made of material from the nose, throat and bronchi. Patients with a frank pathologic process in the sinuses were subjected immediately to such surgical intervention as was indicated. According to the authors, they make it a rule never to operate on a patient with a borderline infection. As a rule they perform a radical operation; if all the sinuses are involved, the Ferris-Smith or Sewell technic is employed. If the frontal sinuses are free, they do an intranasal operation on the ethmoid sinus and a Caldwell-Luc operation. The authors claim that irrigation washings which are sterile on culture do not prove the absence of bacteria, because in 25 such cases they removed pieces of tissue from the sinus which on staining with the Giemsa method and on animal implantations yielded mixed bacterial growths. Of 40 patients on whom total exenteration was done, 40 per cent were free from asthma for from six months to a year (considered failures) and 60 per cent had two or less attacks per year for five years and were able to carry on their work (considered cured).

Nonsurgical treatment depends on the type of infection, the age of the patient, the duration of the disease and the presence of pulmonary changes. Sixteen adults with pulmonary changes were given weekly instillations with 40 cc. of iodized poppyseed oil for twelve weeks. The treatment was helpful but not curative. Twenty-four patients were given instillations of autovaccines, beginning with 5 cc., the dose being doubled every four days until 40 cc. was reached. A full course included 500 cc. Of this group, 16 per cent were free from asthma nine months or more and 50 per cent were relieved for six months. Other methods of treatment, such as injections of extracts from tissue removed at

66. Fox, N., and Harned, J. W.: Treatment of Asthmatic Patients in Otolaryngologic Practice, Arch. Otolaryng. **25**:393 (April) 1937.

operation, injections of serum from patients with asthma previously operated on and injections of pseudoglobulin, yielded negligible results.

A series of 100 patients with chronic cough, nasal discharge or asthma were thoroughly studied by Davison;[67] 45 were found to be nonallergic. When there was a history of influenza or pneumonia, surgical treatment of the sinuses improved the nasal symptoms but did not cure the cough. The sinuses of many of the patients who were allergic showed various types of pathologic changes. Bronchiectasis was found alone in one third of the series, and in the author's opinion it was due to acute destructive pneumonia. The author is impressed with the necessity for thorough and complete diagnostic survey in all cases and emphasizes the importance as well as the difficulty in evaluating the endocrine and allergic factors.

Settel[68] states that practically all infectious diseases of the lower air passages are the sequence of infection higher up by reason of aspiration, muscular and ciliary action, neurogenic balance and lymphatic and ciliary pathways. In addition to evidence accumulated from the literature, the author offers the following supporting contentions, namely, the fact that the same pathogenic organisms found in the lower part of the respiratory tract are present in the upper air passages and also the fact that clinical improvement in the state of the former follows elimination of the bacteria in the latter.

Le Mee, Cler and Langeard[69] reported a case of bronchiectasis associated with maxillary sinusitis in a child of 2½ years before the Société de Laryngologie des Hôpitaux de Paris, which provoked considerable discussion. It was admitted that the connection between sinusitis and pulmonary conditions has not been stressed in the French literature to the degree that it has in the American, English and Italian literature, and the speakers, while conceding that there must be some connection between the two, could not agree on the question of cause and effect. It was suggested that anatomic or hereditary predispositions favored simultaneous development of infections in the two localities.

Arthritis.—Hurd[70] finds infection of the sinuses most frequently associated with rheumatoid arthritis, occasionally of the mixed type and less often of the osteoarthritic type. The sinusitis associated with the first type is usually silent but when eliminated favors the cure of

67. Davison, F. W.: Chronic Sinusitis: Its Relation to Chronic Bronchitis, Pennsylvania M. J. **40**:821 (July) 1937.

68. Settel, N.: Sequence of Infectious Diseases in the Upper and Lower Respiratory Tract, N. Y. State J. Med. **37**:1435 (Aug. 15) 1937.

69. Le Mee, Cler and Langeard: Sinusite maxillaire et dilatation bronchique, Ann. d'oto-laryng., December 1936, p. 1280.

70. Hurd, L. M.: The Nasal Accessory Sinuses as Foci of Infection in Arthritis, M. Clin. North America **21**:1683 (Nov.) 1937.

the arthritis. The pathologic process is most frequently located in the ethmoid sinus and is often associated with infection of the maxillary sinus and is usually of the hyperplastic type. Careful examination will show changes in the color and consistency of the middle turbinates which are significant of a pathologic process in the ethmoid sinus. The author advises operation when the following conditions are present: polypoid degeneration of the mucosa of the ethmoid sinus and roentgenographic evidence of osteitis or thickened mucosa. In such cases the operation should be radical. Also, one must not overlook allergy, vitamin deficiency and endocrine disturbances.

Deafness.—Whiteman [71] treated 79 patients of all ages for various types of deafness (mostly catarrhal), with improvement of from 20 to 70 per cent in 70 per cent. He even claims to have obtained improvement in several genuine cases of otosclerosis. The patients were all treated in Australia, but the author demonstrated his method on 3 of Prof. Hugo Frey's patients in Vienna and states that 2 of them showed definite improvement. According to this treatment, the patient is hospitalized for two weeks. A window is made in each antrum, the inferior meatal opening being made very large. Twice daily the antrums are irrigated with physiologic solution of sodium chloride. This is followed by the inhalation of menthol vapor. The patient is instructed how to pass a catheter into the sinus so that he may continue the irrigations at home. The author claims that the treatment stops the nasal discharge and dries the nasal passage, which results in improved hearing. The inhalations of menthol vapor must last a full hour and should be repeated frequently. (This treatment would have to be thoroughly controlled by careful audiometric examinations through various seasons before the results could be appraised.)

Mental Disease.—Graves [72] found 1,425 of 1,881 patients examined at the Birmingham Mental Hospital to be suffering from disease of the sinuses. The antrums alone or in combination with other sinuses were affected in 1,148. He cites numerous cases showing how the discovery and drainage of a closed empyema or "occult" sinusitis resulted in relief from mental disorders. He points out that when a diseased sinus ceased to discharge, the symptoms of toxemia made their appearance. In some of the cases the disturbance came on some time after an attack of influenza, when all the nasal symptoms had subsided. He quotes Pickwith and Wright as having demonstrated cases in which only a diligent and persistent search for the focus led to its discovery, and whenever pus

71. Whiteman, R. J.: Neue Therapie für Schwerhörige, Wien. med. Wchnschr. **87**:900 (Aug. 28) 1937.

72. Graves, T. C.: Nasopharyngeal Sepsis in 2,056 Cases of Mental Disorder; The Importance of Closed Sepsis, Brit. M. J. **1**:483 (March 6) 1937.

was found and eliminated the patient always recovered from the mental disorder. (Not much is said about the type of mental disorder that was under investigation, although mention is made of psychoses and manias incorrectly diagnosed. Also there is no statement as to how many of the group mentioned were treated or operated on and what percentage were cured and how long the cure lasted.)

MALIGNANT TUMORS

Huizinga's [73] article is based on studies of 35 cases of malignant tumor of the nose and sinuses and deals with difficulties of diagnosis from both the clinical and the histologic aspect. One must always bear in mind when taking a specimen for biopsy that different portions of the tumor may present varying histologic pictures, so that it is impossible in some cases to obtain a clear picture of the true nature of the growth from only one section. This is particularly true of sarcomas, which may resemble a granuloma and vice versa. One case in point was that of a man of 60 with a tumor-like swelling near the internal angle of the eye, which on biopsy was twice diagnosed as giant cell sarcoma but which eventually was proved to be Paget's disease. In another case a tumor of the antrum was first diagnosed as squamous cell carcinoma with pearl formation, but a later biopsy specimen yielded tissue rich in cellular material of unusual polymorphous structure, and the diagnosis was changed to sarcoma. Later a third biopsy specimen was examined and a diagnosis of carcinosarcoma was made. At autopsy a thorough study of the region showed both types of tumor present. A rare case of lymphogranuloma of the antrum of a young girl is described in detail and reference is made to Gräff's [74] interesting analysis of this not unusual type of growth. The author also calls attention to the difficulty of diagnosing erosion of the floor of the frontal sinus in malignant disease because of anatomic variations in this region and the uncertainty of roentgenograms.

Öhngren [75] presents a thorough analysis of his treatment of malignant tumors of the upper jaw as practiced at the Sabbatsberg Clinic and Radiumhemmet in Stockholm. From 1924 to 1936 he treated 235 patients. One hundred and twenty were followed for five years or more, and 35 per cent were found to be living without recurrence for periods of from five to twelve years. His method comprises thor-

73. Huizinga, E.: Diagnostiche Schwierigkeiten bei maligen Nasennebenhöhlentumoren, Acta oto-laryng. **25**:296, 1937.

74. Gräff, S.: Ueber die bösartigen Geschwülste und geschwulstähnliche Neubildungen des Epipharynx, Beitr. z. path. Anat. u. z. allg. Path. **95**:497, 1935; Atlas der Erkrankungen der oberen Luftwege, Leipzig, Curt Kabitzsch, 1933.

75. Öhngren, G.: Malignant Disease of the Upper Jaw, J. Laryng. & Otol. **52**:18 (Jan.) 1937.

ough destruction of the tumor with surgical diathermy by either a transfacial or a sublabial approach, depending on the location of the tumor and the presence or absence of involvement of soft tissue. A preliminary ligation of the external carotid artery is done in most cases, and all suspicious tissue is destroyed, even if it means removing the soft tissues of the cheek, the orbital contents, the nasal structures up to the cribriform plate and the tissues within the pterygoid fossa. This is followed by the use of high voltage roentgen therapy or of a radium bomb applied through several portals so as to obtain the maximum of cross fire. At Radiumhemmet high voltage roentgen therapy is used preoperatively and local irradiation postoperatively. The latter is applied within the wound for a total of from 500 to 2,000 milligram hours; the treatment is repeated at intervals of three months. As to metastases in the lymphatic glands, the author has found irradiation to yield better results when used alone than when combined with block dissection. Since the original operation may be prolonged, he prefers a combination of local anesthesia with administration of evipal or chloroform in order to spare the patient the pain which extensive electrocoagulation may produce.

The results obtained by Welch and Nathanson [76] were not as good. Of a series of 106 patients with carcinoma of the antrum treated prior to 1933, 25 per cent were dead within ten months, 50 per cent within seventeen months and 75 per cent within thirty-two months.

Del Regato [77] reports the results of an experiment at the Foundation Curie, in which 10 patients with epithelioma of the maxillary sinus were treated by high voltage roentgen therapy alone. The treatments were preceded by the extraction of all teeth. Four of the 10 patients were alive and free from the disease for periods of from five to fifteen years. The technic used was as follows: from 180 to 200 kilovolts, from 3 to 4 milliamperes, a skin distance of from 50 to 60 cm., with an average daily dose of from 150 to 200 roentgens per hour, and filtration with 2 mm. of copper and 3 mm. of aluminum. Two lateral fields of from 70 to 120 square centimeters, one anterior and one posterior, were treated; occasionally a third field on the opposite side was treated and if necessary an additional field to cover the glands. A total dose of from 4,000 to 8,000 roentgens was given slowly over a period of from five to six weeks. Radioepithelitis appears in from twelve to fifteen days, during which time the treatment is either lowered in intensity or is stopped temporarily.

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76. Welch, C. E., and Nathanson, I. T.: Life Expectancy and Incidence of Malignant Disease: II. Carcinoma of the Lip, Oral Cavity, Larynx and Antrum, Am. J. Cancer **31**:238 (Oct.) 1937.

77. del Regato, J. A.: Roentgentherapy in Epitheliomas of the Maxillary Sinus, Surg., Gynec. & Obst. **65**:657 (Nov.) 1937.

Schall [78] comments on the sequence of exophthalmos following irradiation of carcinoma of the antrum. Five patients were treated by electrocoagulation and local application of 100 mg. of radium packed in gauze into the wound for a total of from 2,000 to 4,000 milligram hours. Interstitial irradiation with radon in needles was used in the cases in which the growth was inoperable. Exophthalmos was noted as early as twenty-four hours after the treatment and as late as several weeks and was accompanied by lacrimation, drying of the cornea and orbital pain. Frequently exenteration of the orbit is necessary to relieve the pain or when the ocular function is destroyed.

Daito [79] reports a case of sarcoma of the upper jaw involving the anterior, medial and inferior falls of the antrum. On account of repeated severe hemorrhage, the external carotid artery was ligated, and the author notes that after the ligation the histologic picture changed from that of a mixed round cell sarcoma to that of a small round cell sarcoma and the fever disappeared. The tumor was resected by a combined Denker and Partsch operation. Daito recommends complete surgical resection of the jaw only if the patient is seen early enough and the general condition is good. He therefore advises opening the sinus in all cases in order to determine the extent of the process before deciding definitely on the treatment to be followed.

Shebesta [80] reports a case of tumor of the upper jaw in a man of 33 in which the diagnosis of lymphosarcoma was not made until after death. The growth involved the antrum, the nasal cavity and the bones of the face, resulting in gangrenous breaking down of the soft tissues over the side of the nose and the adjacent cheek. The biopsy specimens yielded mostly round cells in an abundant stroma. Syphilis, rhinoscleroma and ulcerating granuloma were considered in the diagnosis. Autopsy revealed metastases in the glands and liver, which proved to be lymphosarcoma. (The photographs and descriptions of these cases tally closely with those of 2 cases of "granuloma grangrenescens" of the nose and jaw reported by Joisten [81] and of a similar case reported by Lewy.[82])

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78. Schall, L. A.: Exophthalmos Complicating Irradiation, Tr. Sect. Laryng., Otol. & Rhin., A. M. A., 1937, p. 98.

79. Daito, T.: Ueber einen Fall von bösartigem Oberkiefersarkom, Unterbindung der Arteria carotis externa, Oto-rhino-laryng. **10**:627 (July) 1937.

80. Shebesta, E. M.: Gangrene of the Face Produced by Lymphosarcoma, Radiology **29**:33 (July) 1937.

81. Joisten, E.: Zwei ätiologisch unklare Fälle von gangränescierender Entzündung der Nase und des Oberkiefers, Ztschr. f. Hals-, Nasen- u. Ohrenh. **41**:105, 1936.

82. Lewy, A.: A Case of Gangrenous Osteomyelitis of the Paranasal Sinuses, Arch. Otolaryng. **27**:91 (Jan.) 1938.

Collett, Charachon and Piaget [83] report the case of a woman of 53, edentulous since the age of 20, in whom a swelling of the cheek developed after a blow with the fist about six months previously. She complained of pains and inability to wear her plate. A soft swelling was palpable in the gingival fold, and roentgenographic examination after injection of iodized poppyseed oil showed a cystic mass filling the lower part of the antrum. At operation it was found that the cyst was completely enclosed with a thin bony covering. It was removed, and the sinus was opened. The cyst was filled with caseous material. Recovery ensued. Eighteen months later the patient returned with renewed pains and presented an ulcerated area in the alveolar recess, which bled freely. Biopsy showed a squamous cell carcinoma. The author speculates on the relation of the cyst to the carcinoma. He believes that the paradental cyst which had been long quiescent was incited to activity by the trauma and that the long-standing irritation and chronic sinusitis may have been the etiologic factors in the development of the carcinoma.

Fernandes [84] reports a cure of two and a half years' duration of an extensive carcinoma involving the maxillary, ethmoid and sphenoid sinuses and invading the overlying soft tissues of the cheek. The growth was completely exenterated, and the cavity was treated with radium (amount not stated), which was applied in five sessions. The histologic report was undifferentiated carcinoma: masses of cells in columns with little intercellular stroma and numerous mitoses.

Hill [85] points out the difficulties of treating malignant disease of the sinuses and nasopharynx in the small hospital away from a large medical center. The patient is often financially unable to make a trip away from home. The greatest difficulty lies in the lack of expert laboratory facilities for studying biopsy specimens. Also beginning growths are frequently overlooked. Several illustrative cases are cited. The author favors electrocoagulation followed by intensive irradiation. In cases of involvement of the antrum, one must disregard the cosmetic result in order to treat the lesion adequately.

A case of melanosarcoma invading the nasal passages, the antrum and the ethmoid sinus is reported by Cho.[86] The patient was a woman of 37, and the growth manifested itself by nasal obstruction and hemor-

83. Collet, F. J.; Charachon, J., and Piaget, F.: Kyste du sinus maxillaire suivi d'un épithélioma du maxillaire supérieur, J. de méd. de Lyon **18**:405 (July 20) 1937.

84. Fernandes: Epithélioma des fosses nasales opéré et irradié guéri depuis 2½ ans, Bull. Soc. belge d'otol., rhin., laryng., 1937, p. 58.

85. Hill, F. J.: Malignant Disease of the Sinuses and Nasopharynx in the Small Hospital, Ann. Otol., Rhin. & Laryng. **46**:158 (March) 1937.

86. Cho, K.: Ein Fall von disseminierten Melanosarkomen in der Nasenhöhle, Oto-rhino-laryng. **10**:910 (Oct.) 1937.

rhages. The patient recovered, but the German abstract fails to give the details of the therapy employed.

Another interesting report in the Japanese literature is that of Amano.[87] A primary carcinoma of the ethmoid sinus developed in a boy of 14. The tumor extended in the beginning over the region of the right angulus internus, so that the patient sought advice from an ophthalmologist. A diagnosis of dacryocystitis was made, and dacryocystotomy was performed. As there was no improvement, the patient was sent to the hospital, where in spite of postoperative radium treatment he died. A diagnosis of carcinoma was then made, but the exact histologic type is not given.

Garschin[88] reports a case of primary "carcinoma gelatinosum" involving the frontal sinus, an extremely rare condition. The patient was a man of 74, who was treated for suppuration of the right frontal sinus and had had a number of polyps removed some time previously. Exophthalmos and paresis of the abducens nerve prompted an external operation, at which time the tumor mass was discovered, invading both the frontal and the ethmoid sinus.

Another case of primary carcinoma of the frontal sinus is reported by Casteran and Achotegui[89] in a man of 49 who gave a history of having sustained a blow over the left frontal region six months previously which raised a lump; the swelling disappeared in fifteen days. Three months later the patient noticed that the upper border of the orbit was becoming thick and tender and causing a narrowing of the palpebral fissure. An irregular lobulated swelling was found at the outer third of the supraorbital margin, displacing the eye slightly. The overlying skin was adherent. Roentgenograms showed a dense shadow of the internal portion of the frontal sinus and some blurring of the external and the upper margin of the sinus. Operation disclosed absorption of the bony margin and a perforation of the anterior wall of the sinus. The orbital wall was absorbed, and the tumor was pressing directly on Tenon's capsule; also the dura was exposed but was not adherent. The mass was easily extirpated. It proved to be an epithelioma, partially cylindromatous. The authors comment on the lack of subjective symptoms and state that the diagnosis could be made only after histologic study. They are sure that trauma was the exciting cause.

87. Amano, B.: A Case of Primary Ethmoidal Cancer in a Juvenile, Bull. Nav. M. A., Japan **26**:38 (May 15) 1937.

88. Garschin, M. I.: Zur Frage über primären Krebs der Stirnhöhle, Vestnik. otol., 1937, p. 121.

89. Casteran, E., and Achotegui, M.: Epithelioma primitivo del seno frontal, Rev. argent. de oto-rino-laring. **6**:281 (July-Aug.) 1937.

A third case of malignant tumor of the frontal sinus is reported by Alexandre.[90] His patient was a woman of 43 with an indolently growing tumor over the eyebrow, observed over a period of twelve years. Recently the growth began increasing. It was extirpated and found to be an encapsulated, bloody, friable, grayish-yellow growth invading the frontal bone and growing into the sinus, which was greatly enlarged and encroached on the orbit. The dura was exposed rather widely. The patient was given postoperative irradiation. Histologic examination revealed a hemangiomaendothelioma with a tendency to psammomatous changes. The growth was evidently primary in the bone, with secondary invasion of the sinus cavity. There was no recurrence up to two years.

NONMALIGNANT TUMORS

Cyst.—Rosedale and Koepf [91] report 7 cases of cyst of the maxilla, 6 of which encroached on the antrum. One was complicated by an osteoma and another contained several teeth. Supernumerary teeth were found in 2 cases. Some of the cysts were large, and 3 were bilateral. Two became manifest after extraction of teeth and 2 were associated with carious teeth. The other 3 were of the follicular type. The authors find Hartwig and Mallassez's explanation of the origin of these cysts inadequate, since the inclusion of epithelial rests does not fully account for the fluid content which reappears rapidly after experimental evacuation. Also, they find no reasonable explanation to date of the mechanism of cystic formation. They distinguish radicular from follicular cysts by the fact that the former are always associated with apical granulomas and are therefore the result of preexisting disease about the root of a tooth, whereas the follicular cyst, otherwise known as a dentigerous cyst, is associated with second dentition and may be suspected from "defects in the dental arch due to unerupted or supernumerary teeth." Follicular cysts may contain unerupted teeth, whereas radicular cysts never do.

Bass [92] reports 2 cases of dentigerous cyst. The first case was that of a girl of 19. An upper third molar was extracted and found to have perforated the antrum. The latter was dark. Irrigations cleared up the condition, and the patient was well for eight years. A nasal discharge then appeared with dull pain in the cheek. Pus was found on irrigation, and roentgen examination showed the sinus to be dark with

90. Alexandre, A.: Un caso di emangioendotelioma dell'osso frontale a sviluppo endosinusale, Tumori **11**:493, 1937.

91. Rosedale, R. S., and Koepf, S. W.: Nontumorous Cysts of the Maxilla: Interesting Cases and Discussion, Ann. Otol., Rhin. & Laryng. **46**:652 (Sept.) 1937.

92. Bass, A. L.: Dentigerous Cyst, with Report of Two Cases, Kentucky M. J. **35**:312 (July) 1937.

a curved shadow, as of a cyst with erosion of the lateral inferior wall. A Caldwell-Luc operation revealed a bony cyst involving the entire antrum. The second case was that of a child of 4 with swelling of the cheek for two years and a cloudy antrum. The distribution of the unerupted teeth was universal. Operation was performed by the sublabial route, and a cyst was exposed and peeled out. Three unerupted teeth were found widely displaced. One was in the canine fossa, 1 in the posterior wall of the antrum and the third in the lateral nasal wall below the inferior turbinate.

Falcao [93] reports a case of a boy of 4 who was kicked in the face by a horse, sustaining a fracture of the upper jaw. At his second dentition the teeth erupted irregularly. At the age of 12 it was noticed that there was a fistula in the gingiva of the opposite side, from which pus discharged. Roentgen examination showed both antrums to be dark; there was also an ectopic canine tooth in the superointernal angle of the maxilla. Operation revealed destruction of the anterior wall of the antrum, which was filled by a cyst containing a foul, fungating material. The unusual features of this case were: (1) the atopic position of the canine tooth, which was not within the cyst cavity itself; (2) the fact that the cyst though of dental origin was not a true follicular cyst, and (3) the development of the cyst in an unusual location, namely, the frontal process of the maxilla.

Tabet and Dayde [94] claim that a dentigerous cyst developing at the expense of the third molar is comparatively rare. In the case reported by them the cyst grew into the antrum and became infected through contact with the root of a carious first molar, which gave rise to symptoms leading to its discovery and removal.

Mucocele and Pyocele.—In the reports of the past year every paranasal sinus has been described as the seat of a mucocele.

Williams [95] reports a case in which an unusually large mucocele eroded the cribriform plate and the posterior wall of the frontal sinus. A drainage tract was provided as follows:

". . . mucus membrane overlying the roof of the nose was incised from before backward up to the posterior ethmoid region and the under surface of the flap was denuded of its mucous membrane as were the upper part of the nasal septum and the lateral wall of the nasal cavity above and on the middle turbinate. The flaps were then packed down against the septum and the lateral wall of the nose with a vaseline pack."

93. Falcao, T.: Sinusite maxilar cronica, canino ectopica e cisto dentigero, Rev. oto-laring. de São Paulo **4**:1049 (Nov.-Dec.) 1936.

94. Tabet, G., and Dayde, G.: Kyste dentifere du maxillaire superieur à development sinusien, Ann. d'oto-laryng., May 1937, p. 398.

95. Williams, H. L.: Mucocele of the Left Frontal Sinus: Report of Cases with Rise of Flap of Mucous Membrane to Maintain Patent Duct, Proc. Staff Meet., Mayo Clin. **12**:665 (Oct. 20) 1937.

The pack was removed in twenty-four hours, and recovery ensued, with minimum scarring.

Nakashima [96] reports a case of typical mucocele of the ethmoid sinus, causing exophthalmos and diplopia. The mucocele had been known to be present for fourteen years and was incised and drained a year previous to its complete removal.

In Wildenberg's [97] case the eyeball was displaced downward, forward and outward. There was diplopia, and roentgenograms showed a large opaque frontal sinus; the intersinus septum was destroyed, and the crista galli was pushed backward and outward. Removal of the growth necessitated taking away the entire anterior wall of the frontal sinus and exenterating the ethmoid labyrinth. A marked deformity resulted.

Csillag [98] reports a case of mucocele of unusual interest in that the patient had papilledema with tortuous dilated retinal veins and extreme reduction of vision. The mucocele was found to have eroded the orbital wall as well as the posterior wall of the sinus, exposing a large area of dura. It was also found to have extended far backward into the orbit, displacing and compressing the optic nerve. Removal of the tumor was followed by disappearance of the fundus changes and a marked gain in visual acuity.

Kecht [99] reports a case of mucocele involving both ethmoid sinuses. The septum was eroded clear through, and the dura was exposed. There was no connection with the frontal sinus, as proved by the injection of iodized poppyseed oil. External operation was followed by convulsions and coma, which were relieved after the packing was removed. The author claims to have found only 3 similar cases reported in the literature (Mackenty, Flath and Adelheim and Moure). It is likely that the condition in the author's case originated in one ethmoid sinus and grew through the septum into the opposite ethmoid sinus, since there was a history of an endonasal operation about twenty years previously.

Ichikawa's [100] patient, a woman of 56, had a slight swelling at the internal angle of the orbit for about a year which began to increase in size, accompanied by exophthalmos and neuralgic pains. The lid was incised twice, without much benefit. Roentgen examination showed a

96. Nakashima, M.: Ueber die Mucocele der Siebbeinzellen, Oto-rhino-laryng. **10**:918 (Oct.) 1937.

97. van den Wildenberg, L.: Volumineux mucocèle du sinus frontale, Bull. Soc. belge d'otol., rhinol., laryng., 1937, p. 47.

98. Csillag, F.: Unusually Large Mucocele of Frontal Sinus Causing Severe Impairment of Vision, Budapesti orvosi ujság **34**:830 (Oct. 1) 1936.

99. Kecht, B.: Ein seltener Fall von Mucocele (Pyocele) beider Siebbeinlabyrinthe, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **143**:330, 1937.

100. Ichikawa, J.: Ein Fall von Siebbeinpyocele, Oto-rhino-laryng. **10**:430 (May) 1937.

large cystic cavity in the region of the ethmoid sinus. The secretions contained staphylococci. The mucosa of the middle meatus and turbinate was swollen and polypoid. External operation was followed by disappearance of all symptoms.

Mucocele of the maxillary sinus is unusual. Lopes [101] states that he could find only 15 cases reported in the literature. His patient complained of pain in the cheek. An upper molar tooth was extracted, but the pain continued. Roentgen examination showed a large elliptic shadow almost filling the antrum. The nasoantral wall was pushed medially almost to the septum. Operation disclosed a cystic mass containing a thick chocolate-colored material filling the antrum. The facial wall was absorbed down to paper thinness, and the orbital wall was eroded over an area of 2 square centimeters. The mass came out with the entire mucosa, which stripped off easily. The walls of the cyst consisted of thick fibrous tissue, which was lined with typical mucosa.

Fornari [102] reports a case of mucocele of the sphenoid sinus occurring in a man of 22, who complained of nasal block. There was a reddish mass filling one side of the nose, which seemed to come from high up and looked like a sarcoma. Attempts to secure a biopsy specimen resulted in rupture of a mucocele and discharge of a large amount of dark fluid. Probing led directly into the interior of the sphenoid sinus, which was very roomy. The probe entered to a depth of 8.5 cm. from the nasal spine. The entire anterior wall and part of the floor of the sphenoid sinus had been eroded. The author is certain that the growth could not have originated from the ethmoid sinus, because pressure sufficient to absorb the anterior wall of the sphenoid sinus would have caused encroachment on the orbit, which was not the case in this instance.

Fibroma.—Arons [103] reports a case of fibroma in a boy of 11 who had two teeth removed because of a swelling of the cheek. Histologic examination of tissue attached to one root led to the diagnosis of osteosarcoma. With a radium mold 6,000 milligram hours of treatment was given. The patient also received eight injections of a mixture of erysipelas and prodigiosus toxins, beginning with 1 minim (0.06 cc.) and increasing to 8 minims (0.5 cc.). Two months later he was given a cycle of roentgen irradiation of twelve treatments to three fields, 200 roentgens per treatment, for a total of 2,400 roentgens and nine additional doses of the toxins, beginning with 2 minims (0.12 cc.) and

101. Lopes, O.: Mucocele do seio maxilar, Rev. brasil. de cir. **6**:29 (Jan.) 1937.

102. Fornari, G. B.: Sulla patogenesi del mucocele del seno sfenoidale om descrizione di un nuovo raro caso, Arch. ital. di otol. **49**:315 (June) 1937.

103. Arons, I.: Ossifying Fibroma: Case Successfully Treated with Irradiation, Am. J. Cancer **29**:551 (March) 1937.

increasing up to 16 minims (1 cc.). Ten years later the patient was still free from evidence of the growth. A review of the case at this time proved that the neoplasm was a true ossifying fibroma and not a sarcoma.

Manci's [104] patient, a woman of 37, gave a history of a slowly growing tumor of the upper jaw over a period of ten years. Caries of several teeth led to their extraction. The tumor presented over the cheek and mouth and the buccoalveolar fold and the alveolar process in the region of the extracted molar. Biopsy revealed a fibroma. Radium therapy was tried but yielded no results. The tumor was then excised through a transfacial incision. It was found to extend from the palate up to the floor of the orbit and medially to the nasal wall. Inferiorly it was covered only by the mucosa of the palate.

Antral Polyp.—Oppikofer [105] reports 2 cases of antral polyp. The growths were large and pedunculated, extending to the posterior choanae and showing gangrenous changes due to torsion of the pedicle. In 1 case a Caldwell-Luc operation demonstrated the origin of the growth on the lateral wall of the sinus, the pedicle stretching across the antrum through the enlarged ostium. The polyp in the second case was removed by a intranasal application of a snare. The polyp in the first case measured 13.5 cm. in length. It was an interesting specimen, with a narrow pedicle, the nasal portion shaped by pressure of the turbinate and septum, a globular nasopharyngeal portion, a narrow twisted portion and finally the gangrenous pharyngeal part, which was bilobulated.

Chondroma.—Menne and Frank [106] report a case of so-called chondroma of the ethmoid sinus and by careful study and a review of the literature show that in many instances a growth of the type heretofore reported as primary chondroma of the ethmoid sinus really arises from the septum and invades the sinus secondarily. The error arises from the fact that the growth is not diagnosed in most cases until it has attained such a size that it is frequently impossible to tell exactly at what point it originated. The authors made a thorough roentgenographic investigation in their case and studied the growth at autopsy. The growth occurred in a man of 44, developing over a period of several years and attaining such large proportions as to displace both eyeballs widely. It invaded the orbits, the palate, the nasopharynx, the cribriform plate and the cranial cavity. When the patient was first seen

104. Manci, F.: Fibroma del seno mascellare, Ann. di laring., otol. **37**:1, 1937.

105. Oppikofer, E., Jr.: Ueber Kreislaufstörungen in Retronasalpolypen, insbesondere über die Gangrän durch Stieldrehung, Ztschr. f. Hals-, Nasen- u. Ohrenh. **41**:399, 1937.

106. Menne, F. R., and Frank, W. W.: So-Called Primary Chondroma of the Ethmoid, Arch. Otolaryng. **26**:170 (Aug.) 1937.

the growth might have been operable, but at that time the diagnosis was in doubt. Later when the patient reappeared in the clinic, the mass was of such magnitude as to exclude any consideration of operation.

Rubaltelli [107] reports the successful removal of a chondroma of the ethmoid sinus measuring 3.5 by 3 cm. The operation was done through a Citelli incision, which is similar to the Moure operation except that the incision is carried upward along the side of the nose to the supero-internal angle of the orbit and if necessary may be extended along the supraciliary ridge. This approach affords access to the nasal cavity, the maxillary sinus, the ethmoid sinuses and the sphenoid sinus. In the particular case reported, the cosmetic result was excellent, as the photographs testify.

Osteoma.—The growth in Pieri's [108] case originated in the frontal sinus and invaded the orbit. The mass occupied the entire enlarged sinus and weighed about 100 Gm. Its removal entailed great difficulties and had to be done in two sessions, since the patient was doing poorly under the anesthetic at the first operation. The author believes that osteoma is caused by a renewed activity of the embryonal elements of the periosteum and fibrous tissue induced by trauma.

Marzio [109] favors the theory of Lagrange and Borst, although he admits that the etiologic factors may vary with the individual case. He reports 4 cases, in 2 of which the growth involved the posterior wall of the frontal sinus, exposing the dura. The growth in 1 case was complicated by a mucocele, and that in another was associated with chronic frontal sinusitis.

Lejeune-Laoureux's [110] patient, a man of 37, gave a history of acute frontal sinusitis ten years previously but no history of trauma. He complained of severe pains in the head for two weeks and swelling of the upper lid. Movements of the eyeball were unimpaired, and there was no impairment of vision. At operation the tumor was revealed lying just below a thin external plate of the sinus. It was ivory-like in color and texture and invaded the opposite sinus as well as the orbit. It was released with a chisel and removed in two fragments. Its attachment was found to be the inferoposterointernal angle of the sinus. It measured 5 by 1.5 cm. and weighed 15 Gm. Externally it was dense, but internally it was composed of spongy bone.

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107. Rubaltelli, E.: Contributo al metodo centro-facciale di Citelli nel trattamento dei tumori del naso, Arch. ital. di otol. **49**:64 (Feb.) 1937.

108. Pieri, P. F.: Osteoma gigante del seno frontale di destra con invasione dell' orbita, Valsalva **13**:119 (March) 1937.

109. Marzio, Q.: Tumari dell'orbita; osteoma orbito-fronto-etmoidale, Riv. oto-neuro-oftal. **13**:393 (Sept.-Oct.) 1936.

110. Lejeune-Laoureux: Observation personnelle d'un cas d'ostéome du sinus frontal, Bull. Soc. belge d'otol., rhin., laryng., 1937, p. 122.

Von Eicken and Schürmann [111] report a case in which a bony tumor was removed from the frontal sinus in 1915 and the patient was free from symptoms until two years before the case was reported. He complained of attacks of pains in the ear, culminating in the reappearance of the growth, causing the eye to be displaced downward and outward. At operation it was found to involve the frontal and ethmoid sinuses, exposing a large area of dura. There was considerable hemorrhage during the operation as well as at subsequent dressings. Histologic examination revealed a nodular mass covered with epithelium. The mass consisted of papillomatous components, showing layers of bone laid down concentrically in the subepithelial spaces. It is the contention of the authors that the condition was primarily a papillomatous growth and that the osteoid formation was due to the influence of the epithelium on the indifferent young connective tissue stroma. They claim that the tumor was not a true osteoma but an "organoid mixed tumor" and refer the reader to a thesis on this subject by Hertner for further details concerning the histologic picture.

Miscellaneous.—Michl [112] reports a case in which an adenoma filled the frontal sinus and was removed by an external operation but the patient died of a heart attack. He also reports a case in which a blastoma involved both frontal sinuses and exposed the dura; operation was successful. His third case was that of a simple granuloma causing the same symptoms as a true neoplasm; operation was also successful.

Coates [113] reports a rare case of cholesteatoma of the frontal sinus in a man of 51, who gave a history of trauma at the age of 15, which left him with displacement of the eyeball downward and outward, external strabismus and diplopia, when corrective glasses were not worn. During the World War he suffered repeated attacks of swelling, redness and pain about the eye. In February 1936 an acute infection developed from exposure which resulted in a deep orbital abscess. It was drained by an incision through the lid. Subsequent operation on the frontal sinus disclosed a large cholesteatoma eroding the anterior wall, floor and posterior wall of the sinus. The material removed consisted of a "whitish gray mass which shelled out easily almost intact. It was arranged in concentric layers. The matrix was thin." Coates cites various authors to show that cholesteatoma in this region must be primarily due to fetal inclusion of epidermal tissues, although in his case

111. von Eicken, C., and Schürmann, P.: Zur Klinik und pathologischen Anatomie der knochenhaltigen gutartigen Gewächse der Nebenhöhlen, Ztschr. f. Hals-, Nasen- u. Ohrenh. **41**:291, 1937.

112. Michl. R.: Tumors of the Frontal Sinus, Časop. lék. česk. **76**:967 (June 11) 1937.

113. Coates, G. M.: Cholesteatoma of the Frontal Sinus, Arch. Otolaryng. **26**: 29 (July) 1937.

it was not at all improbable that the epidermal inclusion might have been due to trauma.

Gutierrez [114] removed a dermoid cyst from the frontal sinus of a man of 23. The tumor had been present for five years as a small hard mass which caused no symptoms, until it suddenly began to increase in size and give rise to a feeling of weight. Roentgen examination after the injection of iodized poppyseed oil showed that the mass was encroaching on the sinus cavity and the orbit. It was removed through an external incision and was found to be secondarily infected, probably because of contact with the sinus mucosa.

Wattles [115] reports a rare case of benign giant cell tumor of the ethmoid sinus in a man of 21. There was a history of trauma, and the first diagnosis was mucocele. The mass was removed through an external incision and was found to have eroded into the orbit as well as superiorly, exposing the dura. Histologic examination showed cells of three types, spindle, round and giant cells. The spindle cells made up the bulk of the tissue. The growth was markedly vascular, and there were large cystlike spaces containing both normal and broken-down red cells. Among the masses of spindle cells were many small spicules of new bone, all healthy. This is a characteristic finding in such tumors but is not always demonstrable. The giant cells were found near the periphery and were large with clear cytoplasm, taking a basic stain and containing many large darkly staining nuclei in the center. No mitotic figures were seen. The tumor has been known since 1845, when it was first reported by Pare and Lebert, but the classic description of it was written by Nélaton in 1860. A review of the literature reveals only 7 cases reported involving the ethmoid sinuses in the period from 1860 to 1935. The other bones of the body are more frequently affected by this growth than are the bones of the skull. There is a history of trauma in 64 per cent of the cases. It is assumed that they develop from the centers of ossification of cartilage bone. They are benign in their course and do not recur after surgical excision.

Bryant [116] reports a case in which a cystic mass enclosed in a thin bony capsule filled the maxillary sinus and appeared to originate in front of the third molar. There was a history of extraction of the second

114. Gutierrez, A.: Quiste dermoideo supurado de la region frontal en communicacion con el seno frontal, Bol. y trab. de la Soc. de cir. de Buenos Aires **21**: 795 (Sept. 22) 1937.

115. Wattles, M.: A Case of Benign Giant Cell Tumor of the Ethmoid Labyrinth with a Review of the Literature, Ann. Otol., Rhin. & Laryng. **46**:212 (March) 1937.

116. Bryant, B. L.: An Unusual Tumor Involving the Maxillary Antrum, Arch. Otolaryng. **25**:581 (May) 1937.

upper molar on the left side four years before without complications. A swelling developed about two years later and disappeared spontaneously after several weeks, recurring four months before the reported examination. It was incised and drainage persisted. The author discusses the differential diagnosis between true adamantinoma and radicular cyst, and in the case cited inclines to the diagnosis of the former because of the presence of a definite thin bony capsule.

(To be concluded)

News and Comment

AMERICAN CONGRESS OF PHYSICAL THERAPY AND AMERICAN OCCUPATIONAL THERAPY ASSOCIATION

The seventeenth annual scientific and clinical session of the American Congress of Physical Therapy will be held cooperatively with the twenty-second annual convention of the American Occupational Therapy Association, Sept. 12, 13, 14 and 15, 1938, at the Palmer House, Chicago. Preceding these sessions, on September 7, 8, 9 and 10, the congress will conduct an intensive instruction seminar in physical therapy for physicians and technicians.

The convention proper will have numerous special program features, a variety of papers and addresses, clinical conferences, round table talks and extensive scientific and technical exhibits.

The instruction seminar should prove of unusual interest to every one interested in the fundamentals and in the newer advances in physical therapy. The faculty will be comprised of experienced teachers and clinicians; every subject in the field of physical therapy will be covered. Information concerning the convention and the instruction seminar may be obtained by addressing the American Congress of Physical Therapy, 30 North Michigan Avenue, Chicago.

Abstracts from Current Literature

Ear

STREPTOCOCCUS MENINGITIS. F. COONLEY, New York State J. Med. **37**:573 (March 15) 1937.

Two recoveries from streptococcic meningitis are reported. One of these was in a girl 11 years of age. Meningitis followed acute mastoiditis, and a pure growth of Streptococcus haemolyticus was obtained from the spinal fluid. All blood cultures were negative. Erysipelas streptococcus antitoxin was used both intramuscularly and intraspinally. In the second case, that of an adult, the streptococcus was not found in the spinal fluid.

AIKMAN, Rochester, N. Y. [AM. J. DIS. CHILD.]

STREPTOCOCCAL MENINGITIS FOLLOWED BY RECOVERY. J. McQ. THOMAS, Proc. Roy. Soc. Med. **30**:411 (Feb.) 1937.

A boy of 7 years had had scarlet fever followed by otitis media in April 1936. Paracentesis on the right side and incision of a postauricular abscess on the left side were performed. Thereafter he had paralysis of the left side of the face. In the middle of September he was admitted to the hospital because of vomiting, fever, drowsiness and earache for the preceding three days. At the beginning of October cortical mastoidectomy was performed on the right side. Ten days later cortical mastoidectomy was performed on the left side, but no pus was found in the antrum. Lumbar puncture showed turbid fluid under normal pressure. Culture showed no growth. There were 6,000 cells per cubic millimeter, and most of them were polymorphonuclears. A week later a few gram-positive diplococci were found. A derivative of sulfanilamide, prontosil (the hydrochloride of 4-sulfamido-2′, 4′-diaminoazobenzene), was given, 2 tablets three times a day. The temperature fell and the symptoms disappeared. The administration of the drug was continued for one week. A month later lumbar puncture revealed normal fluid under normal pressure. The Wassermann reaction of the fluid was negative.

WILLIAMSON, New Orleans [AM. J. DIS. CHILD.]

ABSCESS OF TEMPORAL LOBE OF OTITIC ORIGIN, CURED BY PUNCTURE AND WIDE DECOMPRESSION. C. VINCENT, M. DAVID and H. ASKÉNASY, Rev. d'oto-neuro-opht. **15**:81 (Feb.) 1937.

It has been shown by Vincent, David and Askénasy (*Rev. d'oto-neuro-opht.* **14**:593, 1936) that it is possible to cure certain encapsulated abscesses of the brain by removal en masse without drainage and that encapsulation can be favored by preliminary puncture and wide decompression. The case reported demonstrates that when the condition is in certain acute stages decompression and puncture alone may effect a cure. The patient, aged 8 years, experienced a progressively increasing syndrome of intracranial hypertension two weeks after purulent otitis of the right ear. Seven weeks after beginning of the otitis, operation revealed a nonencapsulated abscess of the temporal lobe, with extensive collateral edema. Evacuation of the pus by puncture without incision of the dura, combined with wide decompression, caused such rapid and complete disappearance of the symptoms that it seems warranted, more than ten months after the intervention, to anticipate a definite cure. The authors believe that if, in certain cases, puncture of the abscess and decompression transform a subacute into a chronic, encapsulated abscess, which may subsequently be removed en bloc, a similar technic is capable in certain other cases of effecting a cure rapidly and more simply by causing resorption of the

inflammatory focus without the necessity of capsule formation. The difference in the evolution of an abscess after decompression is due in large part to a difference in the virulence of the causal micro-organisms. In the case reported the infecting organisms were the staphylococcus and the streptococcus. Cerebral edema was responsible to a greater degree than the purulent collection for the intracranial hypertension. The treatment of cerebral abscess must embrace not only evacuation of the pus but, especially, control of the edema.

DENNIS, San Diego, Calif. [ARCH. NEUROL. & PSYCHIAT.]

VALUE OF ANISOCORIA IN DIAGNOSIS OF OTITIS MEDIA IN INFANCY. S. JANNUZZI, Pediatria **45**:39 (Jan.) 1937.

Jannuzzi describes at length an acute sympathetic syndrome of infection of the middle ear in children.

In his report he presents only 2 cases in which spontaneous anisocoria was shown; in the remaining cases the pupillary inequality had to be demonstrated by means of drugs. In the majority of cases he revealed miosis of the eye on the side of the affected ear, and in 2 cases he met with mydriasis. He feels that an inflammatory or a destructive process of the middle ear can provoke excitability or destruction of the sympathetic fibers that run in the middle ear and states that this sign is helpful in the diagnosis of otitis in children.

PALMIERI, Brooklyn. [AM. J. DIS. CHILD.]

OTITIS MEDIA IN NURSLINGS. V. TESAŘ, Časop. lék. česk. **74**:1258 (Nov. 8) 1935.

The author feels that a daily aural examination should be given infants with dietary disturbances, even in the absence of any symptoms referable to the ear. Collapse of the upper part of the posterior auditory wall speaks for a purulent infection of the antrum auris. A temperature of over 38.5 C. (102.5 F.) in the presence of purulent otitis in an infant is regarded as an indication for paracentesis, and if there is no tendency to healing after three weeks of discharge, mastoidectomy is recommended. In bilateral otitis immediate paracentesis of both drums is recommended. In bilateral mastoiditis the side more severely affected should be operated on first; the more mildly affected side may clear spontaneously. Bilateral mastoidectomy may involve too severe an operative shock for some subjects. In the presence of poor hygienic environment the combination of otitis with nasopharyngitis and dyspepsia may be frequent and severe.

STULIK, Chicago. [AM. J. DIS. CHILD.]

OTITIS AND TOXICOSIS IN INFANTS. A. TEN BOKKEL HUININK, Nederl. tijdschr. v. geneesk. **80**:4874 (Oct. 31) 1936.

A girl of 4½ months showed acute dyspepsia and high fever for six days. Her general condition was bad. The blood was highly toxic. Repeated paracentesis, performed without proper indication, had no result. As the condition was hopeless, both antrums were opened; mucopus with diplococci was found on both sides. Three hours later undisturbed recovery began. The author observed 10 analogous cases. In each case the desperate condition of the child justified the mastoid operation. Recovery took place in 6 cases.

VAN CREVELD, Amsterdam, Netherlands. [AM. J. DIS. CHILD.]

Pharynx

A COMPARATIVE STUDY OF HEMOLYTIC STREPTOCOCCI ISOLATED FROM THE THROATS OF RESIDENTS OF NEW ORLEANS AND NEW YORK. P. TEIGER and B. C. SEEGAL, J. Bact. **32**:631 (Dec.) 1936.

The authors state that a study of the geographic distribution of rheumatic fever, scarlet fever and acute glomerulonephritis in Canada and the United States

has shown that two of these three diseases, rheumatic fever and scarlet fever, diminish in frequency in the South, while acute nephritis remains approximately as frequent in the South as in the North. Since clinical and laboratory data indicate that acute glomerulonephritis is usually initiated by an infection with hemolytic streptococci, it appeared peculiar that the incidence of this disease failed to diminish in the southern part of the United States while the incidence of the other two diseases due to hemolytic streptococci did decrease.

A series of cultures was obtained of material from the throats of patients with acute nephritis and acute pharyngitis and from normal persons (controls) living in New Orleans, and 63 strains of hemolytic streptococci were isolated. These were brought back to New York and compared with 103 strains isolated in cultures of material from the throats of patients in the city of New York. The organisms were examined for their fermentation of lactose, mannitol and salicin, their hemolysis in blood pour plates, their production of a soluble hemolysin and skin toxin, their hydrolysis of sodium hippurate and their final p_H in dextrose broth. In these tests no difference was found between the hemolytic streptococci isolated from the throats of residents of New Orleans and of New York.

STOESSER, Minneapolis. [AM. J. DIS. CHILD.]

RETROPHARYNGEAL ABSCESS. L. RICHARDS, New England J. Med. **215**:1120 (Dec. 10) 1936.

Richards reports a series of 162 cases of retropharyngeal abscess observed at the Children's Hospital in Boston during the past ten years. The fatalities numbered 12, or 7.4 per cent. The oldest patient was 12 years of age; the youngest, 4 months. By far the greatest number of patients were between the ages of 6 months and 3 years. Previous illnesses included sore throat in 22, otitis media in 21, cervical adenitis in 46 (glands previously incised in 8), head colds in 26, tuberculosis in 2, unexplained fever in 16, measles in 3 and nephritis in 1. The chief complaints included dyspnea (noisy breathing, snoring, cyanosis) in 61, dysphagia (regurgitation, anorexia, refusal) in 59, swollen neck in 37, stiff neck in 31, sore throat in 9, fever in 27, cough in 3 and convulsions in 2.

The retropharyngeal abscess merged with the preceding condition, but, on an average, the symptoms due to the retropharyngeal abscess were of about four days' duration. Inspection and palpation of the throat were the two major methods of examination, yet both palpation and inspection have resulted disastrously in more than one able operator's experience. Except in cases of dire urgency, a lateral roentgenogram of the neck should be used instead.

The treatment for retropharyngeal abscess is drainage, which is accomplished by an incision made internally through the posterior pharyngeal wall or externally through the soft tissues of the neck. The operative procedures in this series included incision (pharyngeal) in 135, external incision in 2 and transtonsillar incision in 2. In 5 an incision had been made before the patient entered the Children's Hospital. In 18 instances some form of general anesthetic was administered, 14 patients receiving ether and 4 gas and oxygen. In the other 144 cases no anesthetic was administered. Four patients were operated on in the upright posture. The remainder, as far as could be determined from direct mention of the position, were operated on in the prone or the exaggerated prone, so-called Rose's position.

In 115 cases the outcome was recorded as uneventful. In 4 instances tracheotomy was necessary; in 8 there was prolonged sepsis; in 14 supplementary or secondary incision into the abscess cavity was deemed advisable; in 8 secondary incision of infected cervical glands was necessary; in 12 incision was followed by a fever in which for some reason or other the temperature failed to return to normal; in 3 there was severe hemorrhage, and in 17 there were so-called late complications, such as meningismus, pneumonitis, otitis media, sinusitis, scarlet fever or unexplained cough.

Sudden severe, profuse hemorrhage, often recurrent, has been one of the most dreaded complications of retropharyngeal abscess. There were 3 instances in which such hemorrhage occurred, and in 2 it proved fatal. Sudden severe hemorrhage must be controlled at once by carotid ligation.

GENGENBACH, Denver. [AM. J. DIS. CHILD.]

Nose

USE OF BENZEDRINE VAPOR IN CHILDREN. J. A. SCARANO and J. F. COPPOLINO, Arch. Pediat. **54**:97 (Feb.) 1937.

Benzedrine vapor was used in the treatment of rhinologic infections in 100 children. Prompt and adequate shrinkage of the nasal mucosa occurred, with no secondary reactions, local or systemic. ORR, Buffalo. [AM. J. DIS. CHILD.]

EXPERIMENTAL VACCINATION AGAINST COLDS IN AN INFANTS' HOME. M. J. WALLFIELD, J. Pediat. **10**:69 (Jan.) 1937.

Children in the Infants' Home, Brooklyn, who had had frequent colds and involvement of the upper air passages were chosen for the experiment. The ages ranged from birth to 6 years. In 1933 a commercial catarrhal vaccine (called vaccine B in the paper) was used. The following year, in addition to the commercial vaccine, a nonspecific vaccine (called vaccine A in the paper), obtained from saprophytic bacteria of the air, was used. The injections were begun in October of each year. One course of eight subcutaneous injections was given at the rate of two injections a week. The initial dose was 0.1 cc., and subsequent doses were increased gradually to 1 cc., a total of 4.6 cc. being given to each child. In each experiment the period of observation was one year. All temperatures over 100 F. were recorded, as well as the type and the number of infections of the upper part of the respiratory tract. Twenty-four children were given injections in 1933 and 40 in 1934. The results of the first year showed a reduction of 52 per cent in the number of days of fever and of almost 29 per cent in the number of colds in the vaccinated group. The results of the second year showed no appreciable difference in the number of days of fever and the number of colds between the group given the nonspecific vaccine A and the group given vaccine B. The nontreated controls showed an increase of 29 per cent in the days of fever and had almost 21 per cent more colds. Wallfield believes that better results might be obtained by increasing the dose of the vaccine or by using the particular antigen to which the children are sensitive. RAUH, Cincinnati. [AM. J. DIS. CHILD.]

EXTERNAL PUNCTURE AND DRAINAGE IN SUPPURATIONS OF FRONTAL SINUS. K. BECK, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **142**:205, 1936.

Beck describes further observations after the so-called puncture treatment of frontal sinusitis, which he recommended several years ago. Treatment involves drilling a small opening in the anterior wall and introducing a small cannula (1.8 mm. thick), which is left in place for several days. Two or three times each day the secretion is aspirated and solution of epinephrine introduced into the cavity. Whereas the aspiration of the secretion is at first painful and only a little epinephrine can be introduced into the cavity, the pain and the swelling of the nasofrontal duct begin to subside. As soon as this duct is free, the cannula can be taken out and the small puncture opening heals. The author discusses and refutes some of the criticisms of this method. Regarding the indications for it, he says that in cases in which real empyema exists it is inadequate, because in such cases a wide opening according to one of the well known surgical methods is required. He shows that his puncture method is indicated chiefly in cases of acute and subacute frontal sinusitis accompanied with severe pain and refractory to the usual methods of treatment. In some cases the author observed the com-

plete absence of exudate, but the nasofrontal duct was closed. Simple opening, with or without the use of epinephrine, often counteracts the symptoms. Swelling with closure of the frontal duct and with stasis of the mucosal vessels is the chief problem. Opening of the sinus by puncture often effects improvement. In conclusion the author emphasizes that his method produces excellent results, provided it is used in the right type of case. EDITOR'S ABSTRACT.

RHINITIS CASEOSA. VALERIE BALLÁCS, Monatschr. f. Ohrenh. **70**:1432 (Dec.) 1936.

Ballács points out that the term rhinitis caseosa is derived from the character of the secretion, which consists of fetid scales, some of which are yellowish white and shiny while others vary from grayish yellow to brownish and form smeary crumbs or membranes. Former reports about rhinitis caseosa permit the differentiation of three types: (1) the uncomplicated type, in which a chronic impairment of the mucous membrane resulted in hypertrophy, polyposis, obstruction of the nose, increased secretion and stasis in the accessory sinuses; (2) the type in which exist deep-going inflammatory processes of the sinal mucous membrane, periostitis and osseous necrosis, and (3) the type that is complicated by rhinolithiasis, atrophy and ulcerations due to pressure. The author discusses 5 cases, 3 of which belong to the first type and 1 each to the second and the third type. He shows that the development of rhinitis caseosa is dependent on (1) the dystrophic condition of the mucous membrane, which is produced by chronic inflammation; (2) the secretory stasis resulting from the obstruction of the nose, and (3) the influence of as yet unknown micro-organisms the metabolic products of which transform the secretion into the caseous type characteristic for this type of rhinitis.

EDITOR'S ABSTRACT.

Miscellaneous

ARGYRIA. A. W. STILLIANS, Arch. Dermat. & Syph. **35**:67 (Jan.) 1937.

Stillians reviews the literature on argyria. The discoloration may be local or generalized and may be due to the absorption of silver during contact with it in industry or during therapeutic use of silver preparations, the most common instance being the continued unsupervised use of silver compounds by the laity in self treatment of nasopharyngeal ailments. Diagnosis is not difficult in that "in no other condition is there a bluish discoloration of the parts exposed to light while the rest of the skin remains ashy gray or even nearly normal in color." The only ideal treatment is prophylaxis. Only 1 case of cure of generalized argyria has been recorded besides the one reported by the author. He gave sodium thiosulfate orally and intravenously in large doses for one month, then methenamine intravenously for one month, without definite results. However, a plaque painted to match the skin was made at the onset of the treatment, and by comparison the "result was wholly satisfactory." The skin, because of the action of light, is probably the last to release its silver deposits. Local treatment consists in the intradermal injection of 1 per cent potassium ferrocyanide and 6 per cent sodium thiosulfate. In the case reported, each injection left a light spot almost as pale as normal skin. By many injections of the reducing solution the whole anterior portion of the face except the lower eyelids was cleared. If argyria develops in a child and the absorption of silver is discontinued at once, the prognosis is fair, for as the child grows, the silver deposit spreads over a large surface, and in this way the color is lightened. DULIN, Iowa City. [AM. J. DIS. CHILD.]

GENICULATE NEURALGIA (NEURALGIA OF NERVOUS FACIALIS): FURTHER CONTRIBUTION TO SENSORY SYSTEM OF FACIAL NERVE AND ITS NEURALGIC CONDITIONS. J. RAMSAY HUNT, Arch. Neurol. & Psychiat. **37**:253 (Feb.) 1937.

Although this article is primarily concerned with neuralgia arising from the geniculate ganglion, nevertheless the discussion of the anatomic features of the sensory and sympathetic nerves of the face and their relation to deep orbital pain

should be of interest to all ophthalmologists. There is a discussion of sphenopalatine ganglion neurosis (Sluder's syndrome), the pain of which is localized in the root of the nose, in and about the eye and in the upper part of the face and the upper teeth and sometimes also in the lower jaw, the lower teeth, in the temple and about the zygoma, the ear, the mastoid, the occiput and the neck, the hand and even the finger tips.

Hunt summarizes the neuralgic disorders of the various cranial nerves as follows:

1. True trigeminal neuralgia, which is distributed in one or more branches of the trifacial nerve and in which the pain is localized in the more superficial structures of the face and the intraoral region. This is classic prosopalgia or trifacial neuralgia. In cases of neuralgia of the third division of the fifth nerve there is often associated otalgia.

2. Geniculate neuralgia, which involves the deeper structures of the face. This is characterized by pain in the deep posterior orbital, the palatal and the nasal region, with painful sensation of pressure in the face. This is geniculate deep prosopalgia, and with it there is associated geniculate otalgia.

3. Glossopharyngeal neuralgia, which is characterized by neuralgic pains in the distribution of the glossopharyngeal nerve at the base of the tongue and the adjacent regions of the throat and by associated otalgia.

4. Superior laryngeal neuralgia, of vagal origin, in which the pains are localized in the region of the larynx, with associated otalgia.

All these various forms are accessible to surgical intervention by the cranial method of approach through the posterior fossa, which exposes the fifth, the seventh, the ninth and the tenth cranial nerve. If this procedure is carried out with the use of local anesthesia, it is possible by touching any one of the nerves to reproduce the neuralgic pain, thus confirming the clinical diagnosis, which is often involved and difficult.

An excellent series of references is included.

R. IRVINE, Los Angeles. [ARCH. OPHTH.]

OCULAR SIGNS OF THROMBOSIS OF INTRACRANIAL VENOUS SINUSES. FRANK B. WALSH, Arch. Ophth. **17**:46 (Jan.) 1937.

The ocular signs of thrombosis of the cavernous and lateral sinuses are well known, but there is no complete agreement regarding the mechanism producing them. The ocular changes of thrombosis of the superior longitudinal sinus are even less well understood. Some of the conditions hitherto diagnosed as serous meningitis, pseudotumor of the brain or chronic arachnoiditis may be due to thrombosis of the venous sinuses in the presence of an abnormal pattern of the sinuses. Walsh correlates some of these possibilities with the anatomicopathologic changes in cases of septic thrombophlebitis of the cavernous and lateral sinuses.

Aseptic thrombosis occurs in the nonpaired sinuses, is rarely associated with purulent infection, shows a tendency to organization or resorption, is rarely complicated by meningitis and in one-half the cases is followed by extravasation into the brain and a tendency to softening. Septic thrombosis occurs in the paired sinuses and is characterized by frequency of purulent infection, meningitis and cerebral abscess, a tendency to purulent degeneration of the thrombus and, rarely, extravasations into the cerebrum and the cerebellum.

The thrombi grow in the direction of the flow of the blood stream, but they may develop in the opposite direction. Such retrograde development is frequent in the intracranial venous sinuses, where it may be accounted for by the absence of valves in many of the venous channels, as well as by the plentiful collateral circulation. Septic thrombi result in bacteremia and septicemia and, through direct extension, may give rise to abscess of the brain and meningitis.

In septic thrombophlebitis of the cavernous and lateral sinuses, chemosis appears to parallel exophthalmos, which may be unilateral or bilateral. The degree is variable and is much less marked when the cavernous sinus is involved through retrograde extension from the lateral sinus than when it originates from an anterior infection.

Edema of the lids is a striking feature in cases of fulminating thrombosis, especially when the thrombosis arises from an anterior infection. Infection, rather than vascular obstruction, accounts for swelling of the lids. Walsh agrees with Faulkner that swelling of the lower lid is not pathognomonic of thrombosis of the cavernous sinus and may be due to infection of the antrum or of the ethmoid sinus.

Paralysis of the extraocular muscles is an early symptom. Ptosis develops later. Behr expressed the belief that external ophthalmoplegia is purely mechanical and is due to a lesion of the nerves in the cavernous sinus, caused by pressure or inflammation.

Internal ophthalmoplegia is rarely encountered at the first examination and is described as a late symptom. Parsons stated that paralysis of the external rectus muscle is the first sign of involvement of the second eye. He stated that such a paralysis is to be explained either by basilar meningitis or by increased intracranial pressure.

Anesthesia of the cornea occurs early, though increased corneal sensitivity has been observed. Cloudiness and necrosis of the cornea result from exposure. These are of slight importance in establishing the diagnosis. The fundus may remain normal throughout the course of the disease. Generalized retinal edema may be apparent. Pulsation of the retinal arteries was observed in 1 case, but hemorrhages were infrequent.

Thrombosis of the longitudinal sinus usually commences in the middle fifth of the sinus. Anatomically, the high position of the sinus, the low pressure, the slow current and the presence of pacchionian bodies predispose to thrombosis. It occurs usually in debilitated infants and as a result of changes in the blood itself, notably chlorosis. Jacksonian convulsions occur frequently. Symptoms of involvement of the pyramidal tract confined to the lower limbs may be present. Conjugate deviations of the eyes occur often. Exophthalmos has been reported, but rarely. Papilledema and engorgement of the vessels of the scalp, the retina and the conjunctiva occur, but, on the other hand, there may be complete absence of these signs.

When the thrombotic process is septic and has extended to the longitudinal sinus from the lateral sinus, the prognosis for life is bad. Doyle, in describing this type, concluded: 1. In the absence of meningitis, early apathy or stupor in a patient with evidence of thrombosis of the transverse sinus indicates infectious thrombosis of the superior longitudinal sinus by retrograde extension, especially if associated with choked disks or convulsions. 2. When tumor or inflammatory disease can be excluded, jacksonian seizures showing progression from one foot to the other or beginning in the foot and gradually involving the homolateral upper extremity suggest impairment of the circulation of the cerebral veins and probably thrombosis of the superior longitudinal sinus. 3. Abrupt onset of symptoms of increased intracranial pressure with fluctuations suggests thrombosis of the superior longitudinal sinus, as well as ventricular tumor. Absence of progression after a fair length of time or actual regression of symptoms is suggestive of thrombosis of the superior longitudinal sinus.

Bilateral papilledema is the outsanding symptom of thrombosis of the lateral sinus. Unilateral papilledema may be present at times.

SPAETH, Philadelphia [ARCH. NEUROL. & PSYCHIAT.]

ALLERGY OF EYE, EAR, NOSE and THROAT. L. UNGER, Illinois M. J. **71**:47 (Jan.) 1937.

Unger points out that one who has allergic symptoms in any part of his body is apt to have evidence of hypersensitivity in another organ. There is usually an increase in the percentage of eosinophils in the blood and in the secretions of the

eyes, the nose and the bronchial tubes. Hay fever from pollen is probably the most frequent cause of allergy in the eyes. Vernal conjunctivitis has not been definitely proved to be allergic. The results of treatment from the allergic point of view have not been satisfactory. So-called nonseasonal allergic conjunctivitis is due to sensitization to some substance other than pollen. In treatment, the specific cause should be removed whenever possible. When complete removal of the cause is impossible, desensitization should be attempted. Patients with contact dermatitis of the eye are not allergic in the ordinary sense of the term. They do, however, usually react positively to the patch test. Recent work indicates that allergy is an important, perhaps the sole, cause of Ménière's syndrome. Because of the serious nature of the condition, all patients with Ménière's disease should be subjected to a complete examination, including tests for allergy. A large percentage of patients seen in rhinologic practice are definitely allergic. Routine examinations of nasal secretions will change old methods of treatment. Patients with mucous polypi are definitely allergic. The best treatment to date for hay fever from pollen remains the injection of the appropriate extract of the pollen. The value of nasal ionization is still in dispute; its results in the treatment of hay fever from pollen usually are not good; in the treatment of vasomotor rhinitis some workers report considerable success.

BARBOUR, Peoria. [AM. J. DIS. CHILD.]

ENCEPHALOGRAPHY WITH ETHYLENE. HENRY NEWMAN, J. A. M. A. **108**:461 (Feb. 6) 1937.

Newman finds that the unpleasantness of encephalography is lessened and its scope of usefulness increased when ethylene, which is only one-fifth as soluble as nitrogen monoxide, although seven times as soluble as air, is used. To date he has performed encephalography with the use of ethylene in 30 cases. In 24 of these visualization of the ventricles and the subarachnoid channels was excellent; in 5, only fair, and in 1, poor. In the last case, however, a subsequent trial with air yielded no better results. A survey of 189 cases in which encephalography was performed with air showed no higher percentage of satisfactory results. Because of the fairly prompt disappearance of ethylene in the subarachnoid spaces, it is essential that roentgen examination be made immediately after the injection, as a delay of as little as fifteen minutes may result in poor visualization. The headache complained of during injection of the gas did not differ in kind or degree from that experienced by patients in whom air was injected. After the injection, however, the condition of the patient presented a striking contrast to that following the use of air. Most of the patients were comforable within three or four hours and able to eat the evening meal, and in almost every instance they were up and about on the following day. The average period of hospitalization following the procedure was reduced from three days when air was used to one and eighty-five hundredths days with ethylene, and the condition of the patients on dismissal was in general better than that after the longer period with air. That the shorter period of recovery from headache is due to more rapid absorption of ethylene seems probable. The author believes that the solubility of the gas, and not its anesthetic properties, is responsible for its advantage over air.

EDITOR'S ABSTRACT. [ARCH. NEUROL. & PSYCHIAT.]

OBSERVATIONS ON EFFECT OF PRONTOSIL AND A RELATED COMPOUND IN HEMOLYTIC STREPTOCOCCUS INFECTIONS. P. GROSS, F. B. COOPER and R. R. MELLON, J. Bact. **33**:72 (Jan.) 1937.

The observation has been made by other investigators that the protective and curative effect in mice of a new derivative of sulfanilamide known as prontosil soluble (the disodium salt of 4-sulfamidophenyl-2′-azo-7′-acetylamino-1′-hydroxy-naphthalene-3′, 6′-disulfonic acid) discloses a remarkable paradox. Mice infected with highly virulent mouse passage strains of human origin showed a much higher

percentage of recovery than mice infected with nonpassage human strains of low virulence. Realizing the effect of diverse strains in mice, the authors thought repetition with other strains desirable.

Accordingly, the Pion strain (Pasteur Institute) of relatively low virulence and the Stoddard strain, human type, of high virulence were employed. Although definitely favorable effects were noted with the Stoddard strain, no comparison can as yet be drawn between it and the Pion, owing to an unexpected fluctuation in virulence in the Stoddard strain. But with the Pion strain only 1 of 10 controls was alive after fifteen days, while 6 of the treated mice were alive and apparently normal. Similar results were obtained with the already known sulfanilamide.

In several clinical cases a favorable effect appeared, but in only 1—a case of meningitis due to a hemolytic streptococcus—was it of high evidential value. No final conclusions can be drawn.

STOESSER, Minneapolis. [AM. J. DIS. CHILD.]

PAROXYSMAL TRIGEMINAL PAIN WITH TUMOURS OF NERVUS ACUSTICUS. H. L. PARKER, J. Neurol. & Psychopath. **17**:256 (Jan.) 1937.

Trigeminal pain is rare in association with tumors of the acoustic nerve. Of 53 cases, Parker found only 4 in which there was disturbance of the sensation of pain. He reports 2 more cases. Because of the rarity of the two conditions, their simultaneous appearance could not be regarded merely as coincidental. The pain was identical in all respects to that of tic douloureux and, as in the latter, could be relieved by injection of alcohol into the peripheral branches of the fifth nerve. Similar occurrence of trigeminal pain in cases of disseminated sclerosis has been reported in the literature. The explanation of such a condition is not yet clear. It has been suggested by Harris that the syndrome of both trigeminal and glossopharyngeal neuralgia is due to septic inflammation of the terminal filaments of the nerves caused by dental, tonsillar or sinal infections, and that the condition may be inherited. Parker does not accept this view and is inclined to agree with Foerster that the condition is one of functional hyperexcitability in the nerve apparatus, conditioned and facilitated by many and different causes. Parker draws analogies between this condition and that of facial spasm and believes that the underlying mechanism is the same in both conditions.

N. MALAMUD, Ann Arbor, Mich. [ARCH. NEUROL. & PSYCHIAT.]

NOSE AND THROAT IN RELATION TO RHEUMATIC DISEASES. H. BARWELL, Lancet **1**:67 (Jan. 9) 1937.

When a sore throat has been followed by rheumatic fever it is proper, according to Barwell, that the tonsils should be removed. Numerous small nodules of lymphoid tissue remain scattered over the pharynx, so that acute pharyngitis can and does occur after tonsillectomy. Hence this operation does not with certainty prevent recurrence of acute rheumatism, though it makes it less probable.

Diagnosis of tonsillar sepsis is easy in many cases but difficult in others; as usual, it is more difficult to exclude the diagnosis of an unhealthy condition than to confirm it. Redness of the anterior pillar is considered an important sign. Squeezing the tonsil after cocainization or aspirating it with a suction cup may give valuable evidence. LANGMANN, New York. [AM. J. DIS. CHILD.]

MIXED MENINGOCOCCAL AND STREPTOCOCCAL MENINGITIS. A. A. CUNNINGHAM, Lancet **1**:198 (Jan. 23) 1937.

An 11 month old boy was first admitted to a hospital with follicular tonsillitis and otitis media on the left. About a month later he was readmitted with meningococcic meningitis as well as a recurrence of the otitis media and mastoiditis. At operation the dura mater was incised. This incision may have been the path of secondary infection, but it is likely that the streptococci reached the meninges by direct extension from the ear.

If there is a mixed meningeal infection, the usual antimeningococcic therapy must be combined with immediate operation on the infected mastoid, but unless there is clinical evidence of an intracranial abscess, the membranes of the brain should not be opened.

LANGMANN, New York. [AM. J. DIS. CHILD.]

VESTIBULAR REACTIONS IN CHRONIC ALCOHOLISM. J. A. BARRÉ and O. METZGER, Rev. d'oto-neuro-opht. **15**:87 (Feb.) 1937.

During the past several years Barré and Metzger have studied the vestibular reactions in cases of chronic alcoholism and have accumulated the protocols in 60 cases. The cases are classified as instances of marked, moderate or slight polyneuritis, instances of delirium tremens and instances in which there were no characteristic signs of polyneuritis. Study of the results of vestibular examination show: (1) The reaction to the rotation test is the first to be affected and is most profoundly modified in cases of chronic alcoholism; (2) in a certain number of cases of generally severe involvement caloric hyporeflexia is observed, and (3) the reaction to the galvanic test is almost always unaffected, even in severe conditions of long standing. The type of dissociation deserves emphasis and appears to be peculiar to chronic alcoholic intoxication. Possibly it is a manifestation of neuritis of the most peripheral vestibular nerve fibers, which would be in accord with what is known of the action of alcohol on the nerves.

DENNIS, San Diego, Calif. [ARCH. NEUROL. & PSYCHIAT.]

RELATION BETWEEN ENLARGED TONSILS AND MENTAL DEFICIENCY. T. BRANDER, Monatschr. f. Kinderh. **69**:57 (Feb.) 1937.

In 373 premature children aged from 7 to 15 years Brander found that the incidence of mental retardation was parallel to the degree of tonsillar hyperplasia. The greater the hyperplasia, the lower was the general average of the intelligence quotient. The defects of intelligence being of relatively mild degree, the tonsillar hyperplasia cannot be considered a factor of oligophrenia.

Brander does not claim that the associated mild mental defects are necessarily due to the enlargement of the tonsils. In the presence of large tonsils the symptoms of the more defective children seem to be accentuated. Perhaps enlargement of the tonsils and mental retardation have a common cause. Removal of tonsils may help some children, but it is valueless in such conditions as oligophrenia.

GERSTLEY, Chicago. [AM. J. DIS. CHILD.]

IS LYMPHATIC TISSUE IN NASOPHARYNX A PROTECTION AGAINST INFECTION? G. EIGLER, München. med. Wchnschr. **84**:284 (Feb. 19) 1937.

The old theory that the lymphatic tissue in the nose and throat is a barrier to systemic infection is no longer tenable. Phagocytic cells, which are essential in the protection against invading organisms, are absent or sparsely present in the tonsils and the adenoids. Eigler fails to find histologic or biologic evidence that the tonsils and the adenoids aid in the development of antibodies. After these tissues have been removed surgically, a patient is less susceptible to catarrhal pharyngitis, diphtheria and scarlet fever.

BRAHDY, Mount Vernon, N. Y. [AM. J. DIS. CHILD.]

Society Transactions

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

WALTER H. THEOBALD, M.D., *President*

Regular Monthly Meeting, April 4, 1938

PAPILLOMA OF THE TONSIL: REPORT OF THREE CASES. Presented by DR. IRA FRANK.

True tumors of the tonsils are rare lesions, those of the benign type being much less frequently observed than those of the malignant. Benign tumors include most commonly fibroma, papilloma, lymphoma and angioma; myoma, adenoma, lipoma, chondroma, teratoma and mixed tumor also occur but with far less frequency. Pedunculated or sessile papillomas or diffuse papillomatous hypertrophy of the tonsil, including epithelial elements, must be distinguished from the ordinary adenoid lymphoid hypertrophy of the tonsil, although from the clinical standpoint the distinction is almost exclusively of academic interest, either condition calling for tonsillectomy. (An extensive review of the literature was given.)

According to the records of the department of pathology of Michael Reese Hospital, in the past six years only 3 patients with hard papilloma of the tonsil came for examination. (Because of the rarity of reports of such lesions in the literature, short résumés of these 3 cases were given.) All the patients were men. The histologic changes were in general similar in all—a squamous papilloma, the squamous epithelium extending in finger-like, sometimes branching projections about a delicate core of connective tissue. The epithelial cells did not vary in structure, and the base of the projecting mass was well demarcated by the tonsillar epithelium. There were no signs of inflammation.

Clinically, papilloma of the tonsil is more frequently observed in adults than in children; it is probable, however, that in young subjects papillary hypertrophy may often be disguised under the general appearance of ordinary lymphoid tonsillar hypertrophy. Whether or not benign papilloma may become malignant is open to doubt.

Subjective symptoms are usually insignificant; there may be some irritation and soreness of the throat. If the growth is pedunculated it may form an impediment to respiration and swallowing. In some cases diagnosis has been made only after tonsillectomy for ordinary hypertrophy. In each of the 3 cases reported the clinical diagnosis of hard papilloma was verified by histologic examination.

The treatment is electrocoagulation or, better, complete removal of the affected tonsil.

DISCUSSION

DR. HOWARD BALLENGER: I am under the impression that papilloma of the tonsil is somewhat more common than one would assume from Dr. Frank's review of the literature. It is possible that some of these small isolated polyp-like growths that one sometimes sees on the tonsil are not true papillomas. I have seen a few of that type which I have called papilloma but have not always checked by a microscopic section. It is probable that most of the cases are not reported in the literature.

DR. FRANCIS LEDERER: Two questions arise in connection with this presentation: first, whether in Michael Reese Hospital all tonsils were routinely sectioned to find these 3 cases recorded by Dr. Frank and, second, whether they were serially

sectioned in order to be certain that such a report could be interpreted with any degree of accurracy. In this instance there is again lack of evidence that reference to the literature supplies a fundamental basis for argument. As Dr. Ballenger said, I am certain that many more such instances are observed by clinicians than are recorded in the literature. I believe that if one canvassed the physicians who have observed these benign tumors, particularly those of papillary type, it would be found that such lesions are more common than this report would indicate.

DR. IRA FRANK: I cannot answer Dr. Lederer absolutely. Since there were gross lesions, I believe that only tonsils showing something abnormal were sectioned. I, too, thought the condition occurred much more frequently than it does until I looked up the literature.

A CASE OF STREPTOCOCCIC MENINGITIS WITH STREPTOCOCCEMIA: RECOVERY. Presented by DR. ALFRED LEWY.

R. L. H., aged 14, was operated on May 5, 1937, for acute mastoiditis and subperiosteal abscess. She was discharged from the hospital on June 4, 1937, with a dry ear and the wound healed.

She was readmitted on July 29, 1937, with a history of headache of two weeks' duration, vertigo and vomiting and blurring of vision. She was in a coma two days before admission.

Examination showed a slight discharge from the right ear, tenderness in the mastoid scar, stupor and rigidity of the neck; the Kernig, the Brudzinski and the Babinski signs were positive; facial twitching was manifested; there was paresis of all the right extraocular muscles and of the left external rectus muscle. Examination of the blood showed 70 per cent hemoglobin, 4,000,000+ erythrocytes and 21,000 leukocytes; the urine contained albumin, a few granular casts and a few red and white cells. The spinal fluid under pressure showed 710 cells per cubic millimeter; the hemolytic streptococcus was found in smear and culture. Four successive cultures of the spinal fluid were positive, the fifth being sterile. Three successive cultures of the blood were positive for hemolytic streptococci, and the fourth was negative.

A radical mastoidectomy was performed. The dura was uncovered in the middle and posterior fossae, exposing the lateral sinus. The cisterna pontis lateralis was drained with iodoform gauze. Sulfanilamide was administered; the initial dose was 60 grains (3.88 Gm.) with sodium bicarbonate, and 60 grains (3.88 Gm.) was given daily by mouth with 5 cc. ampules of prontosil (the disodium salt of 4-sulfamido-phenyl-2′-azo-7′-acetylamino-1′-hydroxynaphthalene-3′, 6′-disulfonic acid) intramuscularly daily for four days. This treatment was then discontinued for three days, and solution of potassium arsenite, 2 minims (0.12 cc.) three times a day, was substituted; then administration of sulfanilamide was resumed. Transfusions of small doses of whole blood were given on the second, the fourth and the seventh day. The temperature was normal on the thirteenth day. At this time the optic disks were still blurred, were elevated 1.5 diopter and showed some flame-shaped hemorrhages. These eventually disappeared. Thereafter recovery was uninterrupted.

Five months later the patient is still somewhat anemic but has resumed all normal activities. The left knee jerk is absent, otherwise neurologic findings are normal. She is still under observation.

DISCUSSION

DR. GEORGE S. LIVINGSTON: I recall a previous report by Dr. Lewy of a cure in a case of otitic meningitis in which drainage of the lateral pontile cistern was used but sulfanilamide was not. Two such isolated reports might make one wonder whether the surgical procedure was not more important than the drug, but general experience, of course, points in the opposite direction. Dr. Lewy has

asked me to discuss sulfanilamide therapy from the standpoint of dosage. In cases of meningitis, the adequacy of the dose is probably the determining factor for recovery. From experimental evidence it is known that to protect mice against streptococcic peritonitis a concentration of sulfanilamide in the blood stream of 10 to 15 mg. per hundred cubic centimeters is required. If one uses these figures as a guide, one can then determine an approximately adequate dose, which should then be adjusted to the requirements in the individual case. It has been found that it takes forty-eight hours to attain the desired concentration of sulfanilamide in the blood. If one begins with the usually recommended dose of ¾ grain (0.05 Gm.) to each pound (0.5 Kg.) of body weight in twenty-four hours, in two days one should make a quantitative determination of sulfanilamide. This is done by the colorimetric test devised by Marshall and his co-workers. In cases of meningitis the cerebrospinal fluid as well as the blood should be tested. If the amount is low and the clinical condition has not improved, the dose should be increased.

Sulfanilamide has been found to be excreted at the same rate that it is ingested, and under such circumstances it is sufficient to test the urine content of the blood. In seriously sick patients, however, with meningitis or septicemia, there is a considerable derangement of renal function, so that the test of the urine is unreliable.

I believe that only by frequent quantitive determinations on the blood can potentially fatal infection be safely and intelligently treated with sulfanilamide. Not all infections can be cured with sulfanilamide, but the percentage of recoveries will be increased by the use of these means of adjusting the dosage to the peculiar requirement of the individual patient.

Dr. Thomas Galloway: Since the first of last year at the county hospital 9 patients proved to have streptococcic meningitis have recovered by the use of sulfanilamide and its derivatives, 1 without operation, which is something that was impossible previously; so the effectiveness of the drug cannot be denied. As Dr. Lewy showed, however, proper surgical treatment of the infective focus is still essential. As to the colorimetric test for the proportion of the drug in the blood, it is not difficult and is routine at the Evanston Hospital. An attempt is made to get only a level of 5 mg. per hundred cubic centimeters.

The routine doses at Cook County Hospital are ¾ grain (0.05 Gm.) per pound (0.5 Kg.) of body weight for about three days, then ½ grain (0.03 Gm.) on succeeding days. Recently sulfanilamide has been used in a concentration of 0.8 per cent in salt solution given intravenously. It is interesting to know the amount of the drug being used; twelve thousand 5 grain (0.32 Gm.) tablets were used at Cook County Hospital last month in the treatment of streptococcic infections, and Dr. Fantus is proposing that its administration be limited to cases of serious conditions because of the cost and because of the possibility of unfavorable results from its use.

Dr. Francis Lederer: There are two points that occurred to me in connection with Dr. Lewy's case report. He ceased giving sulfanilamide at the time the patient became cyanotic. I hoped that Dr. Livingston would talk on that point. According to the modern concept of treatment with sulfanilamide, the therapy must be continued despite the cyanosis, which will then subside. There is another point I wish to bring up; viz., has that child entirely recovered? Somehow or other, judging from the history which Dr. Lewy presented, one would suspect that the child may have a latent abscess of the brain. With inability to make a proper recovery, indicated by pallor and failure to gain weight, there should be a strong suspicion of this possibility.

Dr. M. Reese Guttman: One of the drawbacks in the use of large amounts of sulfanilamide has been the danger of methemoglobinemia. Recently an antidote for this condition encountered in the use of sulfanilamide has been found in methylthionine chloride. Small doses are hypodermically injected three times a day. This has been found effective in preventing the occurrence of sulfhemoglobinemia. When the condition has appeared clinically it has disappeared in about twenty-four hours after the use of methylthionine chloride.

Dr. Alfred Lewy: The important thing is to bring out the management by sulfanilamide. Operations have been performed for streptococcic meningitis for many years without any notable success until administration of sulfanilamide was begun, and in addition to the 2 cases of Dr. Galloway in which recovery occurred without operation, I have a case and have knowledge of another in which operation was refused and the child recovered. I think the drug must be given credit for recovery in most cases. That is why it is so important to understand the drug, how to use it, when to discontinue it and what the dose should be in the individual case.

The question of abscess of the brain in this case has been uppermost in my mind, and for that reason the child is still under observation. The child lives out of town, and since the family is poor I strongly suspect that the rather slow recovery may be due to lack of proper food. I have tried to make arrangements with the county nurse to see that she gets the sort of food she should have. I shall continue to watch her for evidence of residual complications in the brain.

Psychiatric Therapy for Dysphemia and Dysphonia. Presented by Dr. James Sonnett Greene.

In this issue, page 213, appears an article by Dr. Greene, entitled "Psychiatric Therapy for Dysphonia: Aphonia; Psychophonasthenia; Falsetto," which includes the material presented in this report except the section on dysphemia, an abstract of which follows.

DYSPHEMIA (STUTTERING)

Stutterers are sympathicotonic neurotic persons whose disorganization, both psychic and somatic, is so marked and so common to all of them that they can be classed as "stutter-type neurotic." The neuropathic diathesis of the stutter-type neurotic person is a hereditary trait. Apparently a disorder is passed on from parents to children which predisposes them to nervous and emotional instability but which is only to a degree a specific organ weakness or inferiority. The chief factor seems to be a disturbance in some stabilizing mechanism—probably a hypothalamic involvement.

Further, the stutter-type person belongs to that group which Pavlov classified (in terms of nervous excitation and interruption of psychomotor function) as "strong but unbalanced." He demonstrates a combination of the harmful effects of excessive excitation and abnormal interruption in his motor functions, so that there is an interference with that inner rhythm so necessary for integrated functioning. When this fundamental lack of rhythm is combined with the high emotional tone of sympathicotonia, one can readily see why the stutterer is predisposed to disorganization and chronic hesitation in general.

Under stress, the behavior of the stutter-type person takes the form of irregular, hesitating physical manifestations, which may be apparent in any of his psychomotor activities. When speech is involved, one designates it as stuttering.

Even with his neuropathic diathesis, the stutter-type person is not necessarily destined to stuttering speech. Only an unfavorable environment—an environment of opposition—which accentuates the native conflicts of the individual, can evoke stuttering in its various forms.

In the stutter-type child, the conditioned reflex of speech is unstable because of his lower grade of psychomotor efficiency; and when such a child is reared in an oppositional environment he easily acquires stuttering speech as a physical manifestation of his underlying diathesis. In such a child any marked initial environmental impact is enough to cause a disturbance in speech. Through anxiety and fear, the experience is repeated again and again, until a definite neural pathway via the cerebral cortex is built up and stuttering speech occurs as a conditioned reflex.

As the child grows older and the social situations become more complex, a chain of humiliations, failures and frustrations is set up, resulting in an anxiety-fear neurosis which in time warps the whole personality. Stuttering, then, is

not a speech defect as the term is conventionally understood, but a deficiency specialization, and all therapeutic measures instituted for stuttering speech must take into consideration the function of the organism as a whole—the entire personality.

DISCUSSION

DR. ELMER L. KENYON: I first met Dr. Greene almost exactly twenty-seven years ago, in Berlin. We came to America, and we have met but a few times since. We have taken different courses. I have taken a path which has attempted to help build up a national movement for handling speech problems. Dr. Greene has stuck closely to his institute. The field covered in his paper tonight is so large that a complete discussion will not be attempted. I wish I might talk about the different types of cases mentioned. Others in the work have handled them all and have handled them effectively and often not in the way described by Dr. Greene. With respect to stuttering, or stammering—it is a matter of fashion whether one uses the one term or the other—there are perhaps six or eight definite theories with respect to the etiology of this disorder, of which one is Dr. Greene's. I have no doubt that none of these theories are true in their entirety. Thus treatment is still on an empiric basis and for the individual physician is determined largely by his own conception of etiology.

Dr. Greene's marked emphasis on what he designated the "stutter type" of person, on which type of personality he believes stuttering depends, is certainly open to question. In 90 per cent of cases the condition begins before the sixth year of life. Why the disorder starts is not known or, at any rate, not agreed on. If the patient continues to stutter he is in a serious situation. He cannot make good in expressing himself. His peculiar efforts at speech constitute a subject for ridicule. He fears to talk. Whatever there may be of a "stutter type" in the stutterer seems to me to be chiefly a development caused by stuttering itself. This is borne out by the fact that no one can foretell which particular child or adult will begin stuttering and also by the fact that after recovery the former stutterer takes his place in life and usually appears no different from other persons.

Dr. Greene's success in treatment, namely cures in 70 per cent of the cases, is excellent. I have never seen published statistics which have indicated above 25 per cent of successes. As to my own treatment of stuttering, I approach the problem from the psychophysiologic standpoint, and when I can obtain complete cooperation I have no failures. This attainment of success in treatment by such widely different methods further indicates how doubtful is Dr. Greene's "stutter type" conception of etiology.

DR. C. T. SIMON: I should like to raise a question with Dr. Greene and make a statement of my own. The question is: How many cases has he found in which the condition has started after the age of 6 years? As Dr. Kenyon mentioned, practically all stuttering is reported to start before the age of 6 years, and it is possible to get the complete family history. Further, it seems many children exhibit symptoms of stuttering but never become stutterers, but sometimes something happens and the boy or girl changes into a stutterer. I wonder whether any information has been found in case histories concerning the greater frequency of stuttering among boys than girls. Why is it more often in boys than in girls that the early symptoms are fixed into a permanent stutter? There is no satisfactory answer to that.

I think that in dealing with stutterers one should get away from the idea that the stutterer is abnormal or deviates sharply from the characteristics of normal persons. From every observation that can be made, the stutterer differs from the normal person only in terms of his speech. Some are beginning to think that the emotional abnormality found in the adult stutterer in all probability is the result of the defect in speech, rather than the reverse.

DR. JOSEPH C. BECK: I should like to speak about this condition from a public standpoint, economic standpoint and charitable standpoint, because many of these

unfortunate persons are without a job and hopeless, and they go away after Dr. Greene treats them, ready to take a position in society.

I met Dr. Greene in Toronto three years ago. He told me the details of his work—using more terms than any dermatologic professor ever employed. That night, at a meeting of the American Board of Examiners, I sat down next to Dr. Mosher and he said to me, "What's the matter with you? You are stammering!"

What interested me in this lecture tonight was the reference to aphonia, hysterical aphonia. All practitioners used to treat patients with this condition and say they were cured. I recently had a disturbing case. The patient had a cyst of the vocal cord. I told Dr. Guttman to take it off, and he did. He told the patient to be quiet awhile, and she has been quiet ever since. She has normal cords, and they move all right. I suppose the trauma, getting the instrument into the throat, produced the difficulty. She was hoarse from the neoplasm, but now that it is gone she is aphonic.

I should like to ask if Dr. Greene has ever used hypnosis in any of his cases. Mention is made by Europeans of the use of hypnosis in treating these patients.

Dr. A. H. Andrews Jr.: Dr. Greene has used a term tonight which I think deserves more emphasis, namely, "organism as a whole." This is important from a philosophic standpoint. The results of his work in curing this type of patient are evident. The same holds true in many other fields. The medical profession has been held back for many years by the Aristotelian concept of dividing a subject into parts, studying their various components and trying to add them up again and get the whole. One should try rather to get a concept of the whole. This holds true for organic as well as for functional diseases and for other parts of the body as well as for the larynx.

Dr. Austin A. Hayden: I should like to ask what Dr. Greene does for the correction or the adjustment of speech for deaf persons.

Dr. J. S. Greene: In reference to imitation as one of the causes of stuttering, it can definitely be said that the percentage of those who commence to stutter as a result of imitation is large, especially when there is an older stutterer in the immediate family.

In reference to Dr. Beck's question as to whether surgical measures should be instituted in cases in which the voice is affected before vocal treatment is undertaken, this of course depends entirely on the nature of the condition. In the case of the tumor of the vocal cord just mentioned surgical procedure is indicated and should be followed by vocal treatment. In answer to his question about the value of hypnotism, I wish to say that hypnotic therapy was given up a long time ago. In this country at the present time it is used only occasionally and simply as an experimental measure. One of the principal reasons for its disuse is that stutterers are introverts and it has been found that it is much more difficult to hypnotize introverted, self-centered persons than so-called extroverts.

In regard to the ratio of men to women among stutterers, an uneven sex distribution has been found. About eight times as many boys as girls stutter. There are obvious reasons for this. First and foremost is the fact that early environmental stress is never so hard on girls as on boys. The element of social competition enters into the life of even the youngest boys much more decisively than into that of girls. Boys are injected into an incomparably more strenuous atmosphere of group games, in which the prowess of much older boys sets the standard. In other words, the social impact is stronger for boys, and it necessarily follows that stuttering is more common among them.

Another factor in the uneven sex distribution of stutterers is that girls inherently possess a finer nervous mechanism, a higher rhythmic sense, better coordination and a higher progressive trend, and for that reason they are less likely to lose their standard of organization under new environmental conditions.

Some persons seem to have been born more awkward than others. The stutterer is one of these persons. He shows his lack of coordination not only in

speech but in his general activities. For instance, a mother will often say that her stuttering child is more clumsy than the other children in everything he does.

Given such a child with a neuropathic diathesis, living in a neurotic environment, it is easy to see how almost any strong environmental impact will precipitate a general disorganization. Since speech is the finest psychomotor function, it is only natural that a certain percentage of these children should show this general disorganization through disturbance of speech. These are temperamental, stutter-type persons who have a relatively high potential for the spread of emotional tone.

To integrate these disorganized persons is the basic problem of treatment. Speech is secondary, because stutterers can all talk when they are alone or with children or animals. I am sure Dr. Kenyon will bear me out.

The first thing new patients are told at the medical-social clinic is that their speech is a matter of no interest. This seems incomprehensible to a persons who for twenty or thirty years has centered all his thoughts on that very thing. It is growth and rehabilitation of personality that is of interest, although corrective work in speech must be done to counteract individual negative habits of speech. Muscular relaxation and coordination are important phases of the therapy. The aim is to inculcate a sense of rhythm and harmony and to diminish tension. Even fencing is used to promote standardization, gracefulness and accuracy of movement.

Of course, the ultimate aim of all phases of the therapy is to promote emotional control and to change the stutterer's warped personality. It has been found that stutterers respond under the right type of guidance, and the therapeutic measures carried out at the medical-social clinic have demonstrated that they have tremendous developmental potentialities.

I see these persons grow. They come in fearful and timid, many of them unable to hold positions. There are doctors, lawyers, accountants and engineers among the patients, all with good educations but unable to meet the outside world. They are given standardization and organization. Their entire emotional pattern is changed, so that they are able to meet life objectively and on an adult level. That is the answer to the stutterer's problem.

In reply to Dr. Hayden's question about therapeutics for the deaf, such work is not carried on on an extensive scale. The patients are usually referred to the League for the Hard of Hearing.

Directory of Otolaryngologic Societies *

FOREIGN

Collegium Oto-Rhino-Laryngologicum Amicitiæ Sacrum

President: Prof. H. Burger, Keizergracht 317 C, Amsterdam, Netherlands.
Secretary: Prof. Dr. C. E. Benjamins, Verlengde Heereweg 143, Groningen, Netherlands.

Sociedad Rioplatense de Oto-Rhino-Laringología (Argentine Section)

President: Dr. Raul Becco, B. Mitre 1690, Buenos Aires, Argentina.
Secretary: Dr. Juan Manuel Tato, Santa Fé 1171, Buenos Aires, Argentina.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. H. Marshall Taylor, 111 W. Adams St., Jacksonville, Fla.
Secretary: Dr. Leroy A. Schall, 270 Commonwealth Ave., Boston.
Place: St. Louis.

American Academy of Ophthalmology and Otolaryngology

President: Dr. Harry S. Gradle, 58 E. Washington St., Chicago.
Executive Secretary: Dr. William P. Wherry, 1500 Medical Arts Bldg., Omaha.
Place: Washington, D. C. Time: Oct. 9-14, 1938.

American Bronchoscopic Society

President: Dr. John D. Kernan Jr., 120 E. 75th St., New York.
Secretary: Dr. Lyman Richards, 319 Longwood Ave., Boston.

American Laryngological Association

President: Dr. George B. Wood, 504 Physicians' Bldg., Philadelphia.
Secretary: Dr. James A. Babbitt, 1912 Spruce St., Philadelphia.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. Harold I. Lillie, Mayo Clinic, Rochester, Minn.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester, N. Y.

SECTIONS:

Eastern.—Chairman: Dr. Frank E. Kittredge, Masonic Temple, Nashua, N. H.
Southern.—Chairman: Dr. Francis E. LeJeune, Maison Blanche Bldg., New Orleans.
Middle.—Chairman: Dr. T. R. Gittins, Davidson Bldg., Sioux City, Iowa.
Western.—Chairman: Dr. Frederick G. Sprowl, Medical Arts Bldg., Spokane, Wash.

American Otological Society

President: Dr. Isidore Friesner, 36 E. 73d St., New York.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.

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* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.